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THE DISTRIBUTION OF RAILWAY SHARES.

Now and then in our experience with the rules of political economy, including finance, there develop statistics which seem to invert those rules. They reverse, indeed, not merely the rules but, seemingly, the most ordinary motives of human policy and action. President Harrison—he was afterward President—in the hot political campaign of 1888 made a hit when on the stump he referred to the "men of maxims, not of markets." He went too wide and flung the net of his epigram too far. A maxim is, in truth, but a principle crystallized into brevity. A theory, if sound, is but a maxim enlarged, a principle deduced from facts. Yet now and then we meet with an apparent exception which has to be pretty closely analyzed to prove the rule.

Such an exception that almost reaches the size and quality of a paradox is suggested by the distribution of railway shares during the year 1908. Returns compiled not long ago for 25 prominent railway companies showed an actual increase of the total stock outstanding of only from $2,890,158,997 to $3,000,248,157, or a little less than 4 per cent. During the same period the number of stockholders increased from 211,069 to 252,083, or somewhat more than 19 per cent.—about five times the increase of outstanding stock measured in ratios. The figures, we presume, at least for the most part, cover the fiscal year for the railways that ended June 30, 1908. But even so they covered not only nine months of a panic and depressed twelve-month but a period of civic onslaught on the railways, federal and state. Such an attack reaching all over the country coupled with reduced earnings was the reverse of favorable to railway investment. It is true that it, from one viewpoint, should have induced selling and, in that sense was favorable to distribution. But selling implies buying and to buying the condition was, on its face, distinctly unfavorable—more so indeed than to selling for, in the psychology of investment, the owner has the "hold on" impulse while the buyer is apt to be conservative and timid. Again, during a time of depression, if new stock is issued the shareholder is likely to take up his stock rather than sell his "rights" low and thus depression, to a degree, resists distribution. The only real distributive force has been the exchange of convertible bonds for stock. But that force has been minor and modified by the fact that the stockholder and convertible bondholder have often been one.

Let us take a concrete case to illustrate the situation. The New York, New Haven & Hartford company during the calendar year 1908 has had no bonds convertible within that time. It has suffered like other roads from the industrial stagnation, in fact more than most of them as tapping intensified factory territory. It has been the object of attack by the federal authorities and of both legislative and judicial attack in Massachusetts—an attack reaching at times a most violent character. Yet during the calendar year 1908 its stockholders have increased, as we are informed authoritatively, about 2,000, or some 14 per cent.; and in Massachusetts, alone, where a majority of its stockholders live and where a plurality of its shares, as compared with other states, is held, the number of stockholders has increased about 900, or more than 12 per cent. And no one will contend for a moment that such a road as the New Haven with its relatively paltry sales in the market is in any degree affected by speculative distribution of shares.

In seeking the causes of distribution of conservative railway ownership against conditions so adverse one is forced back to underlying and fundamental facts which, fully appraised, are the most cheering sign and symptom of the general railway situation. Time—by which we mean past time—and experience have been on the side of the railways. The railways have assumed in the mind of the investor an institutional character. As an investment class they have paid him well in spite of incidental evils of "high" finance. Indeed, in not a few cases, he has been a beneficiary of that high finance which he may not, himself, as a fiscal moralist, approve. He has seen also that the railways have been subject to no such hydraulics as have poured their floods into the industrials and the street railways. As an outcome of all these elements combined the railways acquired a kind of investment momentum that held confidence through adversity. When railway stocks fell the old railway investor naturally bought them first and advised his friends to do so. The contrast is shown by comparison with the industrials which, as a whole, have been much less under civic attack than the railways. While 25 railways, as stated, increased their stockholders 19 per cent., 41 industrials, some of them conservative, increased their stockholders only from 296,292 to 322,277, or less than 9 per cent. Railway stock distribution in ratio was more than double that of the industrials and, of course, among a much more conservative and retentive class.

Besides its suggestion of momentum and confidence through hard times the wide distribution of railway shares has a deeper and a public meaning. The shareholder, if he happens to belong to the right gender votes and influences other votes. His increase and expansion, anatomically speaking, denotes in the body politic a set of fiscal nerves at once more ramified and more sensitive. He creates fresh local "interests" which

must be reckoned with by legislatures collectively and the politician individually. The stockholder was heard from in a national election last autumn. There were elections before that and there will be more.

IMPROVED STEELS.

The steel trade journals report recent improvements in the methods of steel manufacture which result in products so superior to the regular grades that they have peculiar interest to railways which are large consumers of steel. The electric furnace is rapidly coming into use as an important factor in steel manufacture, and where water power is abundant and fuel is scarce it is extending the boundaries which have for a long time confined the iron and steel districts. Experience with the electric furnace in foreign countries has shown that it will purify the metal to a larger extent than the gas furnace or the Bessemer converter, and it is proposed to use it as an adjunct to the ordinary processes of steel manufacture for the purpose of reducing the amount of phosphorus and sulphur and to deoxidize the bath. After a careful investigation by its metallurgists, the United States Steel Corporation has decided to use a 15-ton Heroult electric furnace at the South Chicago works. Three-phase alternating current will be used, and it is proposed to refine the blown metal from the Bessemer converter in the Heroult furnace, reducing the percentage of phosphorus and sulphur, and to use the product for high grade steel rails. The capacity of one furnace is sufficient for the production of 500 tons of steel in 24 hours. By this method it may be found possible to produce low phosphorus rails at the Bessemer works without resorting to the very expensive measure of substituting the open hearth furnace. This experiment will be made at the South Chicago works during the coming summer.

The Heroult steel refining furnace is of the crucible type with a tilting rack. The heating is initially affected by means of the electric arc which forms between the surface of the slagging materials which float on the metal bath and the two massive carbon electrodes which are suspended above it. The impurities of the steel are removed by renewing the slag. The refining operation thus becomes a "washing out" one. Heroult claims that with this furnace iron or steel of any degree of impurity can be refined, and from the purified metal a steel of any desired composition can be produced by the addition of the necessary amount of carburite and other ferro-alloys.

Another interesting item relates to the developments which are rapidly taking place in the manufacture of high speed steel. The Sheffield, England, steel makers were not satisfied to pay tribute to the Taylor-White Company, and they have been experimenting with various alloys and heat treatments and have succeeded in producing a tool steel which in some qualities surpasses those previously made. While the extravagant reports in regard to the cutting power of this new steel may not be found to be entirely correct, yet it is well attested that English manufacturers have succeeded in making a high speed tool steel which has a longer endurance when cutting hard material with the cutting edge at red heat, and it will not crack when plunged into water. Tool steel makers in this country are also improving their product, and there is a prospect of such active competition on both sides of the Atlantic that the railways may soon be able to buy high speed steel at lower prices.

Vanadium steel is used in large quantities by the automobile manufacturers on account of its superior strength, which allows lighter sections to be used. This quality should recommend it for the machinery of locomotives, especially the reciprocating parts, which are often heavier than is necessary, even when made of ordinary carbon steel. If these parts were designed so that the working stresses had the same factor of safety with relation to the elastic limit of vanadium steel, as for the steel generally used, their weight could be materially reduced. Nickel steel for railway purposes has been a disappointment, both for rails and for machinery, and there appears to be a better prospect for vanadium steel. These high grade steels cost more money per pound, but there are places in railway structures where the parts are subject to constant vibration, to alternating stresses or to violent shocks, where they may be substituted for carbon steel and in the end not prove so expensive.

The increase in elastic limit obtained by the use of expensive alloys in spring steel is of little advantage except that it prolongs the life of the spring, for with such material under the same load the ratio of fiber stress to elastic limit is materially less. In the tests made at the Baldwin Locomotive Works on the effect of different methods of tempering the results showed that while the elastic limit was materially increased it had little effect on the modulus of elasticity. As the deflection under a given load bears a direct relation to the modulus of elasticity it is evident that the deflection under a given load cannot be changed by hard or soft tempering. It is also clear that alloy steels which tend to increase the elastic limit cannot result in a reduction in the number of plates or the weight of the spring. Though the elastic limit may be 50 or 100 per cent. greater than that of ordinary spring steel, duplicate springs will act alike under equal loads. The advantage of the improved alloy spring steel must, therefore, be in prolonged life and not in any reduction in weight.

THE SPOKANE RATE CASE.

The decision of the Interstate Commerce Commission in the Spokane rate case raises directly the vitally important questions, what constitutes a reasonable rate; what profit railways are economically and legally entitled to earn on interstate traffic; and what is the basis on which that profit should be computed.

The city of Spokane complained against the rates of the Northern Pacific, the Great Northern and the Union Pacific for two distinct reasons: (1) It was alleged that the rates from the East were unjustly discriminatory against Spokane because they were higher than the rates of the same roads to the Pacific coast terminal point, Seattle. (2) It was also alleged that the rates to Spokane were inherently unreasonable. The commission held that water competition, under the decisions of the United States Supreme Court, entitled Seattle to lower rates than Spokane. But it ordered the rates to Spokane reduced for the second cause alleged, viz., that these rates were inherently unreasonable in that they enabled the carriers to earn profits which were expressly held to be excessive.

Since a comparatively small portion of the profits of the roads are derived from traffic to Spokane, it must follow, if the rates to Spokane are unreasonable *per se*, that the rates to other inland points, such as Denver and Salt Lake City, which are on much the same basis, also are inherently unreasonable and should also be reduced; and the commission as good as says that this is its opinion. But, as the commission concedes, water competition is controlling at coast terminal points, and would be pretty sure to force reductions to the coast corresponding to any made to intermediate points. So the probable effect of the order, if upheld and enforced, would be to leave the relations between rates to different localities practically as they are now, but to reduce in proportion to the reductions to Spokane rates to all coast terminal points, and to all points that directly or indirectly base on coast terminals. The shippers at intermediate points would continue to be at the same relative disadvantage as now in competing with jobbers at the coast; but all would gain something at the expense of the railways. The result would be a greater curtailment of revenues than any group of roads has ever suffered in consequence of the act of any public authority. The reduction in

net revenues would be almost exactly the same as the reduction in gross earnings, which would amount to many millions of dollars; for there would be no resulting reduction in operating expenses, and the articles that would be affected are such that lower rates would cause no perceptible increase in the volume of traffic.

The opinion, which was written by Commissioner Prouty, shows that the commission spared no pains to render a decision that would be in harmony with the views that have been expressed by the Supreme Court of the United States upholding the legal right of railways to discriminate between localities where the circumstances and conditions are substantially dissimilar. It seems rather doubtful if the opinion and order can be successfully attacked solely on the ground that compliance would compel the roads to so discriminate against any locality as to deprive it of any fair advantage that geographical and commercial conditions and the law give to it. As the decision turns on the alleged inherent unreasonableness of the rates made by the railways and the alleged excessiveness of their profits, so, it would seem, must any successful resistance to it be based mainly on the proposition that the rates and profits of the railways in the past have been inherently reasonable and that compliance with the commission's order would so reduce them as to make them unreasonably low *per se*.

The decision is open to attack from the economic standpoint on the ground that the commission takes a wrong view as to what constitutes a reasonable rate. Railway traffic managers in this country, and many of the leaders of thought on railway economics, have contended that rates should be adjusted to what the traffic will bear—on the value of the service. On this basis the transcontinental rate system is easily defensible. All kinds of traffic move freely long distances on the rates fixed by the railways. Far from being a hindrance to the development of the West, the transcontinental rate system has been one of the most potent forces in furthering its wonderful progress and fostering its great prosperity. The railways in that section suffered much adversity up to 10 years ago. During the past decade Great Northern, the Northern Pacific, the Union Pacific, the Southern Pacific, the Santa Fe, have prospered with the rest of the part of the country through which they run. But it cannot be said that their change from adversity to prosperity has been due to high rates. Their rates are not as high as ten years ago. The increase in the gross earnings of the roads is due to the increase in the density of their traffic—in other words, to the increase in the amount of the service that they render to the public. The increase in their net earnings has been largely due to the enterprise and skill with which they have been managed. Each of the roads mentioned has taken many millions of dollars of its earnings and spent them on additions and permanent improvements, so that to-day they not only render more service to the public than ever before, but render better service, both passenger and freight, at the same or less cost to the shipper and the traveler.

Now, can rates be properly held to be inherently unreasonable on which the traffic moves easily; which are low as compared with other rates for similar service throughout the world, and for which much better service is rendered than ever before? If rates are to be held inherently unreasonable because the roads making them are earning large profits, will not a damper be put on enterprise and skill in railway management? What incentive will the management of a road have to seek to build up a large traffic by skilful adjustment of rates; to attract travel by giving the best and safest service; to reduce operating expenses by constantly experimenting with and adopting new and improved appliances, if all profits above a certain maximum—say 4 or 6 per cent.—are to be appropriated by the public by reductions in rates? Such a policy would put a premium on stagnant, imbecile railway management. The Supreme Court of the United States said, in the case of Covington, etc., Turnpike Co. *vs.* Sandford: "If a corporation cannot maintain such a highway and earn dividends for stockholders, it is a misfortune for it and them which the Constitution does not require to be remedied by imposing unjust burdens upon the public." But if a public service corporation can be restrained from exacting exorbitant charges from the public, even if without making such charges it cannot earn a profit, does it not seem that it should follow, that so long as it does not impose unjust burdens by making exorbitant charges, public authorities should be restrained from attacking its rates on the ground that they regard its profits as too large?

Whether, in view of some of its past decisions and contemporary tendencies in the regulation of public utility corporations, the Supreme Court of the United States could be induced to take the view here expressed of what constitutes reasonableness in rates, is open to serious doubt. If it shall be finally held that the true criterion of the reasonableness of rates is the amount of profit that the railways charging them earn, the questions of what percentage of profit a railway is entitled to, and on what basis that profit must be calculated, will have to be definitely fought out, and in some ways the Spokane case would be a good one in which to fight these issues out to a definite conclusion. It is clear that the Interstate commission, in common with most of the state commissions, believes that railways should be restricted to a rather small percentage of return on the value of their properties. In the Spokane case the Great Northern and Northern Pacific introduced a large amount of testimony to show that on the basis of the bare estimated present cost of reproducing their physical properties their earnings are not excessive. The commission conceded that the estimates submitted probably were not far wrong. Nevertheless, it practically ignored them in its decision. It explicitly refused to say whether it regarded the present estimated cost of reproduction of the properties as the proper basis of valuation, but at the same time it broadly intimated that it did not believe that the roads are entitled to earn a return on the present value of real estate which cost them much less than its present value, or perhaps nothing at all. Every state commission that has tried to make a valuation has found that the original cost of construction of the older and larger roads is unascertainable. If, then, the appraisal of the physical property is not to be taken as the basis of valuation of the physical properties, what basis is to be taken? Does the Interstate commission favor the Texas policy of so reducing rates as to confiscate the so-called "unearned increment" and intangible values of railways, and then taxing the roads on what has been confiscated?

It is quite true, as the commission intimates, that if rates are to be based on the rapidly increasing value of the physical properties, rather than on the value of the service, rates in course of time may become much higher than they are now. That, unquestionably is one of the drawbacks of the theory of valuation—which, by the way, is being advocated by the commission, not by the railways. But the proposition to deny to the railways the right to earn a profit on the 'unearned increment" of tneir real estate is simply a proposition to apply the single tax theory of Henry George to the transportation industry alone. It is a proposition to confiscate as much of the value of the real property of the railways as the public may be unwilling to let them retain while letting other owners of real estate enjoy the full benefit of its increase in value. Can this be done under a Constitution that frowns on class legislation and expressly prohibits the taking of private property without just compensation? If the courts finally hold that the reasonableness of rates is to be measured by the profits of the railways, it is hard to see how they can fail to hold also that the proper basis of valuation is the estimated present cost of reproducing the physical properties for railway purposes, with reasonable additions for skill in management and density of traffic; and that the proper percentage

of profit to be allowed is the average percentage of profit earned in other large businesses against which the roads have to compete in the money market for new capital.

If only the reductions in rates specifically required by the commission should be made an unfair discrimination would result in favor of Spokane as against other cities. If all the reductions should be made that the commission clearly foresaw its order probably would compel, even the strongest roads in transcontinental territory would be hard hit, and their weaker competitors would suffer severely. The commission suggests to the carriers that if they can offer any other scheme of readjustment than that indicated in the decision the commission will be glad to give it consideration. No doubt the carriers will submit some plan. The decision is so sweeping in its probable effects, and the principles involved are so important that if some basis of agreement is not reached the courts probably will be appealed to. The resulting litigation probably would exert a profound influence on future regulation of railways.

DELAWARE, LACKAWANNA & WESTERN.

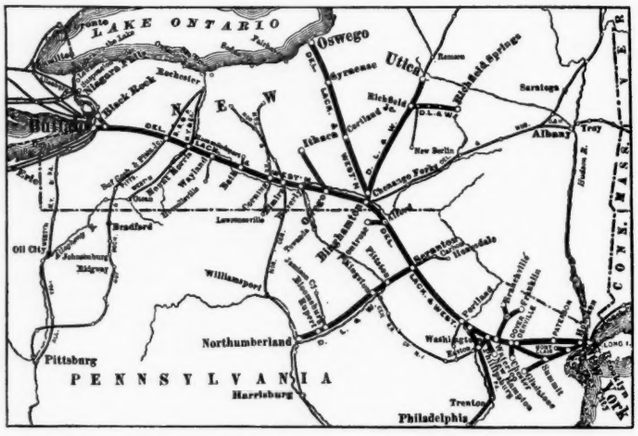
The policy of the Delaware, Lackawanna & Western in accumulating a considerable surplus of anthracite coal during 1908 is in line with that of other coal companies, and should form one of the strongest arguments against a strike by the anthracite mine workers. The total tons of coal sold by the Lackawanna during 1908 was less by 700,000 tons than during the previous year, and as the production was about the same as in 1907, the increase in stocks of coal on hand is about represented by the decrease in tons sold, so that as President Truesdale points out in his annual report, "should there be such suspension [as in 1906] of mining operations, it will be readily seen that the accumulated stocks of coal will be required to amply protect consumers pending the resumption of work;" and as will also be seen, a suspension of work by miners would be in a sense a gain for the coal companies.

The fact that the Delaware, Lackawanna & Western is so large a carrier of anthracite coal, and such a large part of its earnings come either from the transportation or the mining and sale of coal, prevents its showing, in the full year of business depression, 1908, from forecasting the showing to be made by other companies. Total operating revenue amounted to $32,898,495 last year, as compared with $37,264,473 in the previous year, and of this revenue, $14,558,703 was from transportation of coal in 1908 and $14,361,416 in 1907, the earnings from the coal department amounting to $4,166,793 in 1908 and $4,224,921 in the previous year, so that the total income from coal operations was to $18,725,496 in 1908, and $18,586,337 in 1907. These figures do not exactly show the effect of the business depression, as President Truesdale says: "The increase in revenue derived from the transportation of coal was not due to the total tonnage of coal moved during the year being larger than in 1907—in fact, it was slightly less—but in part to the change in the accounting methods previously referred to and to the further fact that a larger proportion of the total tonnage was moved to terminal points west and north, where the haul was longer and the earnings per ton larger. The shipments to tidewater were smaller than during the previous year. The coal moving to tidewater markets earns about 25 per cent. less per ton than that moving to western and northern markets."

The unique position of the Lackawanna as a railway company, without bonds, and with but $26,000,000 capital stock, and a surplus after paying 20 per cent. dividends of $5,457,125 in a year of great business depression, made it possible for the management to pursue an almost diametrical opposite course from that taken by the majority of the managers of other railways.

Construction on the second tunnel through Bergen hill just west of Hoboken, N. J., was carried on without the least interruption from financial causes, and the Lackawanna Railroad Company of New Jersey was incorporated and began building the new cut-off line between Slateford, Pa., and Port Morris, N. J. This cut-off, which saves about 11 miles and materially reduces grades and eliminates curves, was described in the review of the annual report of the Lackawanna published in the *Railroad Gazette*, April 24, 1908. It is estimated that the cut-off will cost between $8,000,000 and $9,000,000, and will require about three years to build, the funds being advanced from the surplus of the D. L. & W., and no plan for permanent financing having as yet been decided on.

Another evidence of the strength of the company is shown in the expenditures for maintenance. The total expenses in 1908 were $18,623,655, as compared with $21,539,739 in 1907, and the expenditure for maintenance of way and structures was $3,343,396, or about $1,641,000 less than the sum shown under the same general heading for the year 1907. The change in accounting methods, however, just about accounts for this decrease, since under the practice of several years, $1,172,121 charged last year to additions and betterments would have been charged to maintenance of way and structures. Maintenance of equipment cost $4,747,700 last year, an increase of $1,016,619 over 1907, but part of this increase is explained by the requirement of the Interstate Commerce Commission of a depreciation charge. The following table shows the unit costs of maintenance, the mileage operated includes all first, second, third, etc., track and one-half switches and sidings:



Delaware, Lackawanna & Western.

	1908.
Maintenance of way per mile, owned and operated	1,711
Average cost of repairs per locomotive	1,703
Average cost of repairs per passenger-train car	603
Average cost of repairs per freight-train car	54

These figures cannot be properly compared with figures given for 1907. The sums spent for repairs are low as compared with other roads operating in the same territory, not because the Lackawanna neglects proper maintenance of equipment, but because its rolling stock is in splendid condition, and therefore needs comparatively few repairs. Forty-nine locomotives, 26 passenger cars, 10 milk cars, 100 refrigerator cars and 300 steel hopper cars were bought or built at a cost of $1,266,549. This cost was charged to replacement account, and left a credit balance at the close of the year of $91,772 to this account.

The reduction in transportation expenses is largely explained by changes in accounting methods.

The principal additions and betterments expenditures were for the new passenger station at Scranton, $601,781 being charged to this account last year, and for the new locomotive shops and machinery at Scranton, $641,986 being charged to this account. There was also $286,708 spent for new piers at Jersey City. The building of these piers consists largely of iron and concrete work, and covers a portion of an extensive system of diagonal docks and warehouses, located on and served by a broad ship canal, and when com-

pleted will give the company valuable terminal facilities for transhipment of freight in connection with both harbor and ocean water carriers.

Traffic statistics show that the average distance a ton of coal was carried was 190 miles, an increase of 10 miles over the already extraordinarily long haul of 180 miles in the previous year. The average distance carried for merchandise freight remained nearly the same as in 1907, being 169 miles last year. The average rate on coal per ton per mile was 0.861 cents last year as against 0.848 cents in the previous year, while the average rate on merchandise freight per ton per mile was 0.708 cents as against 0.682. This higher rate for coal than for merchandise freight is a noticeable exception to the rates on most other roads in this country. The average train load of 484 tons last year and 490 tons in 1907 is low as compared with soft coalers. The Chesapeake & Ohio, for instance, has an average train load of 621 tons.

The tonnage of nearly all commodities was less in 1908 than in 1907, with two rather surprising exceptions. There were 1,018,872 tons of bituminous coal carried last year as compared to 948,146 tons in the previous year, and there were 739,682 tons of cement, brick and lime carried in 1908 as against 592,817 tons in the previous year. These two commodities ordinarily show very quickly any falling off in manufactures and business, and it is rather hard to explain why the tonnage carried by the Lackawanna should increase in a year of business depression, unless it is, that last year the Lackawanna was able to get a comparatively larger proportion of this tonnage than its competitors.

In predicting better times ahead for the Lackawanna, President Truesdale says: "There is little doubt but what the great drop in railway traffic and earnings has proven an object lesson to the large and influential element in our national and state politics which for some years has been vigorously engaged in promoting their political ambitions by extreme railway agitation and legislation, the effect of which has been to undermine the standing and credit of the railways of the country. A sudden and decided halt appears to have been called in the anti-railway crusade which has so actively been carried on during the past three years, and many recent indications point to the fact that this strange and unaccountable craze has at last run its course for the time being at least."

The following table shows the results of operation for the year ended December 31, 1908, as compared with 1907. The figures for 1907 have not been rearranged to correspond to the form of accounts prescribed by the Interstate Commerce Commission and used in 1908:

	1908.	1907.
Average mileage operated....	957	957
Coal transportation revenue	$14,558,703	$14,361,416
Mdse. freight revenue	9,850,008	12,235,808
Passenger revenue	6,449,032	6,757,596
Total operating revenue	32,898,495	37,264,473
Maint. way and structures.	3,343,396	4,974,888
Maint. of equipment	4,747,700	3,731,082
Traffic*	569,398	.....
Transportation	9,312,645	12,254,278
Total operating expenses	18,623,655	21,539,739
Net rev., outside operations†.	155,899	.....
Taxes	1,180,800	1,349,700
Net revenue	13,249,939	14,375,034
Gross income	18,930,191	19,540,189
Net income	13,478,728	13,909,415
Renewals and betterments....	2,781,603	3,820,088
Dividends	5,240,000	5,240,000
Surplus	5,457,125	4,849,327

*Included in transportation expenses in 1907.
†Not shown separately in 1907.

NEW PUBLICATIONS.

Social Engineering. A record of things done by American Industrialists, employing upwards of a million and a half people. By William H. Tolman, Ph.D., Social Engineer, with an introduction by Andrew Carnegie. 384 pages; 6 in. x 9¼ in. Published by the McGraw Publishing Co., New York; 1909. Price, $2.

Dr. Tolman, who is the director of the American Museum of Safety, the secretary of the American Section of the International Congress of Improved Dwellings, a corresponding member of the Imperial Technological Museum of Vienna, etc., has made a profound and far-reaching study of social life in industrial establishments, and the book at hand, covering the results of his researches, is an extremely interesting work. The book is written from the standpoint of promoting industrial efficiency by keeping in good working condition the human machines, and the chapters cover such topics as: The Opportunity for Specialized Education; Educational Trips; Factory Councils; Club Houses; Night Schools; Hygiene; Safety and Security; Benefit Associations; Pensions; Co-operative Committees; Savings and Loan Associations; Housing; Recreations, and the broader topic of communal or social betterment. But these topics give a very inadequate idea of the scope of the work covered. A better idea can be given by mentioning the fact that something like 1,700 suggestions, ideas and incidents of actual industrial welfare-practice are clearly and carefully indexed in the back of the book. The author has perhaps a wider acquaintance than anyone living with the general subject of the promotion of industrial efficiency through all kinds of things that come under the scope of welfare work; and his book at no time gives the impression of being the work of a dreamer or of an impractical man, because it is confined to these concise statements of actual practice, well illustrated and with the minimum of extraneous comment. We are inclined to think that there are very few large employers who could not get ideas with a definite money value from this book.

Letters to the Editor.

THE SPOKANE CASE.

New York, March 8, 1909.

TO THE EDITOR OF THE RAILROAD AGE GAZETTE:

The Supreme Court of the United States settled finally, in the so-called Social Circle cases, that if competition exists at the more distant point which controls the rate at that point, the long and short haul clause of the Act to regulate commerce is not violated by charging a higher rate at an intermediate point. In the Spokane case, the Interstate Commerce Commission has shown a wholesome fear of going contrary to this ruling, but nevertheless gets around it. The Supreme Court held that a lower rate might apply to the more distant point, but threw the burden of proof, as to how much lower that rate should be, on the railway company.

The Interstate Commerce Commission now says in effect to the Northern Pacific: "A lower rate to Spokane than to Seattle is reasonable, but your lower rate is unreasonable, in that it affords more than a fair return on the investment." In this argument there are two things to be determined. What is a fair return on the investment, and what is the investment? The Interstate Commerce Commission discusses original investment and cost of reproduction in a manner intended to convince the reader that the Northern Pacific and the Great Northern are heavily overcapitalized, but it does not decide whether the investment should include the unearned increment resulting from the present location of the Northern Pacific, and its value as a going concern. It, however, assumes in a general, casual sort of way, for purposes of fixing a rate, that it will take the two roads at their own valuation. Surely it is fully as important to know what the investment is on which a fair return must be earned, as to settle the fairness of a given rate of return.

The vague and rather cryptic way in which the commission disclaims any intention of disbursing to the public the surplus of the Northern Pacific suggests the logical conclusion that the Northern Pacific has a right to earn a fair return on this surplus as invested, regardless of whether the surplus was originally earned from fair rates or unfair rates. This seems the just attitude toward the question. It makes no difference how the company originally obtained the funds

which it has invested in its property. The investment as it now stands should earn a fair amount.

The Public, spelled with a capital P, may have paid what the Interstate Commerce Commission now thinks is too high a rate in the past. The excess earnings of the company were invested in the property, and all the public of to-day has got a right to demand is that rates shall not be so high as to return an excessive rate on the whole investment. It is none of the public's business, so far as fixing rates is concerned, as to where the money for the investment came from. There has been no moral wrong committed against the public of to-day by the railway company of to-day, even if the railway company of the past exacted excessive fares from the public of the past. The property of the railway company, and the rights of shippers have both passed to innocent third parties, and the company, by accumulating a surplus and investing it in the property, is not in any sense stealing from the shipper of to-day. It simply in the past directed the use of funds to which at that time it had undisputed right, and those funds have an inherent right to a fair return.

As to the capitalization of the unearned increment, it has been capitalized in every other form of public and private business. It would appear a vast injustice that it should not be capitalized in the railway business. In the Consolidated Gas case recently decided by the Supreme Court of the United States, the court held that the gas company's property could be properly capitalized *as it stood*. It did not attempt to take away the unearned increment accruing to the company from its situation in New York city, nor should the Interstate Commerce Commission take away the unearned increment accruing to the Northern Pacific through the growth of the country which it serves. It is the height of injustice to render valueless the foresight and genius that has gone into the location and building up of the Northern Pacific.

TRAFFIC MAN.

LOCAL FREIGHT OFFICE EFFICIENCY AND THE DEPRESSING INFLUENCE OF THE CIVIL ENGINEER.

To the Editor of the Railroad Age Gazette:

In your grand paper of last week, Charles R. French was bold enough to open up a subject that I have been 20 years waiting for, and that is the numbing effect of an engineer's education which makes him a defective superintendent. He believes that twice two is four, because he can prove it; that excellence of design, material and workmanship in track structures and rolling stock gets safety, economy and efficiency. He can prove this on the drawing board and by statistics. But dealing solely with material things and mathematical niceties is apt to make him bigoted. With men of initiative and imagination he gets cross; calls them promoters, or inventors.

As a railway superintendent he works out this way: He can see that a brick yard, or a shingle mill, can be established on his division and make money if he will make a rate that will move its product 50 miles. To him, "it's the rate that moves the freight" seems to be a sound mathematical proposition. But when he is asked by the local freight agent to consider a change in the freight service that will give a manufacturer a larger zone for his sales; or teaming facilities to save his customers' time and money; he is like the man from Missouri: "You've got to show me," said the man from Missouri, "and you can't." The engineer superintendent is not generally the man to learn that it is the quality of service, rather than the rate, that moves the freight.

The engineer is a great man. The industrial success, the wonderful prosperity of this, the richest country in the world, is largely due to him. I am mentioning his one small defect: he is bigoted: He can look at structural propositions in the large, but the equation of human wants, weaknesses and tastes has variables and unknown quantities that he can't comfortably and exactly fill in from his table of natural sines, so they do not interest him. This defect shows itself when we try to find a civil engineer who has become President, Senator, Congressman, Governor, Assemblyman, or Mayor. Perhaps there are such, but I do not know of them.

I am mentioning to you the one quality in the engineer-superintendent that I don't like, and I thank Mr. French for opening the subject.

LOCAL FREIGHT AGENT.

HOW MANY ENGINEERS BECOME SUPERINTENDENTS?

To the Editor of the Railroad Age Gazette:

Referring to the article written by Charles R. French for your publication of March 5, on page 465:

I gather from his statements that he blames the shortcomings at local freight stations largely to the alleged fact that superintendents are promoted from the Maintenance of Way Department and are consequently only informed upon mathematical, engineering and kindred subjects. Without debating the merits of superintendents having such a foundation for official training and duties, it would be interesting to uncover the extent to which this was really true; in other words, to see what proportion of the superintendents on the railways in the United States actually did meet the specifications.

ENGINEER.

[This could be ascertained as to general, but not divisional, superintendents by study of the "Biographical Dictionary of Railway Officials," which we publish and consent to sell to all comers. But it is not necessary. Mr. French was in error except as to practice on the Pennsylvania Lines. Nine out of thirteen of the Pennsylvania general superintendents, and more than half of their division superintendents, have had engineering education and experience. On other lines it is quite generally true that superintendents earn their promotion entirely in the operating department. This does not necessarily mean that the Pennsylvania "leans" to the civil engineer. Their system is the admirable one of encouraging educated young men to come in the service and be watched. When a young man shows ability in any department he is given a chance to change and learn thoroughly. It is not an unnatural result that in the working out of this system a large percentage of efficient officers should be found among those whose preliminary education was in the most precise and accurate of all the professions.—Editor.]

Contributed Papers.

LOCAL FREIGHT OFFICE EFFICIENCY, FROM THE VIEWPOINT OF THE GENERAL FREIGHT OFFICE.

BY CHARLES R. FRENCH.

II.

As the present law requires that a bill of lading be issued for every shipment, and when bills of lading are issued and out of the hands of railways they are negotiable documents, good for the value of the articles specified on their face, all bills of lading should be carefully checked with the goods before they are signed. Bill of lading clerks should refuse to sign any bills of lading not having the "O. K." of the check clerk. Too much care cannot be taken in this regard.

To facilitate loading and prevent mixing up the loading gangs, it is well, if possible, to load freight for only one direction in the forenoon and the opposite direction in the afternoon. This will have to be governed largely by the leaving time of the trains which pick up the warehouse cars. Shippers will be glad to co-operate with the agent if the proposition is properly put to them.

In loading local or way cars from which freight will be "peddled" to various stations, care should be taken to so load

the freight that shipments for stations may be taken out of the cars practically in station order, first out nearest the door and last out in the ends of the cars. This will save much time and annoyance and not a few "over" and "short" reports, as the train crews will not waste any time looking for packages buried beneath freight for other stations. Such loading is not the easiest, but by the exercise of a little care it can be accomplished and the results will show that it is time well expended.

Particular attention should be given to the loading of fragile and light pieces or packages, so that heavy freight will not fall on them or be skidded against such articles and crush them. Do not stack packages up to the car roof and be surprised if they fall over in transit and break or damage themselves and other freight in the car. Rather spread such packages out one, two or three tiers high and, if their nature will permit it, load other and lighter freight on top of them.

Every railway has issued circulars regarding the practice of loading hides, oil, fertilizer and similar articles in cars other than the ones provided for that traffic, and it is comparatively a rare thing that such loading is encountered. But a word here will not be amiss. When this class of freight is loaded into a new car the odor will remain for months, and the car is not fit for any other class of freight. Such shipments should be held until a proper car is provided for them.

In many of the freight offices no effort at all is made to file tariffs and in others the filing is done in a half-hearted way, so that no good results from the time devoted to it, and when rates are wanted the division freight office is asked for the rate by wire. This burdens the telegraph wires with unnecessary business, takes up the time of the division freight office, delays the billing of the shipment on which the rate is wanted, and unless memorandum billing is issued or the shipment held causes an "over" report to issue.

A simple, comprehensive tariff filing system would obviate all this and make the hunt for rates a pleasure. Such a system, uniform in every local freight office of a railway, could be easily installed.

Heretofore tariffs have been of all sizes, shapes and kinds and their filing in anything approximating order has been a difficult thing. The Interstate Commerce Commission has partly lessened this difficulty by decreeing that all tariffs should be after a pattern adopted by that body. All new tariffs must conform to their requirements, so that in a short time all tariffs will be uniform.

In considering a filing system three things are necessary—a comprehensive index, adaptability to any line of tariffs, quickness in locating the desired rate. Considering these points, a card index appears to most nearly cover the requirements, being easily accessible, easily kept, and having the added value of carrying no "dead" matter in it. When a tariff is canceled, the cards referring to it may be taken out and destroyed or filed in a "dead" file.

These cards should show the tariff number, date effective, commodity on which the tariff applies and the territory to and from which the tariff applies. The index should show, first, the tariff by numbers; second, by commodities, and, third, by territories, so that having any one item, number, commodity, or territory, the proper tariff may at once be located.

If a file of canceled tariffs is kept, when a tariff is canceled, note on the card corresponding to it the date of cancelation, by what authority, and if superseded by another tariff, the number of the superseding tariff, filing the card in the "dead" file.

The tariffs may be kept in a cabinet having a number of compartments of suitable size and labeled numerically, or in such manner as in the opinion of the agent will render reference to them most easy.

Another method of filing tariff sheets and pamphlets, but which will not lend itself to the larger book tariffs, is that of pasting them into a large invoice book and cross-indexing, as above, in the index provided in the book. Either system will render reference to the tariffs an easy matter, provided the file is kept up-to-date. This can be done with very little work if it is done at the time the tariff is received, but if they are allowed to accumulate it becomes burdensome. Be on the job.

The writer recently, while traffic manager for a manufacturing concern, used a system of cards, alphabetically arranged and divided by states, on which he compiled the rates to practically every important city in the United States, Canada and Mexico, basing on Philadelphia. The original work was very tedious, but after it was completed caused very little work to keep it up-to-date. This file was used entirely as a basis for quotation of prices, yet it might easily be made to serve as a labor-saving device in a local office.

Unless a tariff is carefully perused, properly understood and accurately handled, many and costly errors are likely to be made. If careful inspection of a tariff does not make it clear, it should not be used until it has been interpreted and is fully intelligible. When once understood, care is the only thing necessary to use with it.

The bill clerk will find it a great help and saver of time if he will note the percentage divisions of through rates in the spaces usually left in the tariff between the name of the town and the state:

			Basis—Boston.	Basis—New York.	Delivering line.
ADRIAN,	P. R.R. ... 40% / P. CO. ... 45% / D., T. & I. 15%	*Mich.*	15	12	Wabash.
			15	12	D., T. & I.
			15	12	L.S. & M.S.
AKRON	P. R.R. ... 40% / P. CO. ... 40% / C., T. & V., 20%	P. R.R. ... 35% / P. CO. ... 45% / C., A. & C. 20% *Ohio*	10	8	B. & O.
			10	8	C., A. & C.
			10	8	C., T. & V.
			10	..	Erie.

thus making reference to the percentage sheets for every shipment unnecessary.

The agent at a station which the writer frequently visited has prepared a complete table of percentage divisions of rates applying from his station in book form, showing the division of each rate under each percentage for the six classes and also on all existing commodity rates. This is the only station at which the writer has seen such a thing attempted, and it was of considerable interest to him.

Instead of having to stop to figure out each percentage division of a rate every time it is used, all that is necessary at this station is to turn to the page indicated by the percentage division and the base number, then to the class or commodity on which division of rate is desired, and copy the figures. It is such an ingenious idea and such a great labor saver that the writer wonders it has not been copied broadcast. In addition to the saving of time, the chance of making errors in figuring divisions of rates is eliminated entirely, and it certainly will increase the efficiency of the billing force. An idea of the arrangement of the book follows:

Base No. 75.	1.	2.	3.	4.	5.	6.
3.3 per cent.	.066	.0561	.0462	.0363	.033	.0264
4.5 per cent.	.090	.0765	.0610	.0495	.045	.0362

With the tariffs fixed, showing the percentages, as above described, and the percentage divisions of rates figured out and made up in book form, the bill clerk should be in excellent shape for high-pressure work.

A system successfully used in the billing room at one station frequented by the writer was as follows:

Of three bill clerks, one was appointed chief; all shipping memos came to him from the check clerk; each memo was routed, rated and the billing point entered by him, together with the divisions of through rates where necessary. For this purpose he used a rubber stamp reading:

BILL TO.....
VIA..... at.....

Memos were then turned over to the bill clerks for billing, the chief helping also with the billing when he had finished routing and rating all memos.

In the morning the first duty of the chief bill clerk was to go over the press copies of the previous day's billing, check

up each waybill with the memo. and order corrections made for all errors detected, keeping a list of the errors made by each man, which record was posted each month in the office. He then prepared a classified tonnage report for the agent, showing carload and less carload business separately, total tonnage and total revenue outbound for the day.

The writer was informed that the number of errors charged against his station in the billing room had been cut down over 75 per cent. since the adoption of this system.

In billing, the easiest way is always the best. Do not crowd and scheme to get a large number of items on a small sheet; think of the man who has to check from that bill; make your billing plain; use room enough to make it easily read; make your figures plain; abbreviate only such words as lend themselves to easy translation and use the accepted abbreviations only. The writer has frequently seen billing where the letter "b" was used promiscuously for box, barrel, bag and bundle. Every agent has received waybills that were absolutely unintelligible and knows how he felt about the fellow who made them; do not let such waybills go out of your office. Should a shipping memo. be illegible, do not guess at it, but take time to find out what the memo. calls for.

The errors charged against each station by the auditor, superintendent or general freight agent and the sarcasm expended in calling attention to them, is a thing no agent particularly enjoys, especially as he has not made them himself. He has to take the blame for them, however, and concerns himself with plans for reducing their number the following month or the employment of drastic measures if they are not reduced.

The most practical means for reducing the number of errors seems to be a system of counter checking, charging the errors made (only those which get beyond the office and on which it is necessary to issue corrections) against the party making them, and the publication of the record each month showing the number of errors made by each employee, compared with his record of the preceding month, and, if possible, the same month of the previous year. Comment is not necessary, as each man's performance is its own commendation or condemnation; if it be good, he is justly proud of it, and resolves that it shall stay that way; if it be poor, he is ashamed of it, and makes up his mind to "show somebody something next month," which he generally does by cutting down his total.

Such a system puts every man on his mettle; every man knows the record of every other man and his pride makes him want that record to be good. Errors can not be avoided entirely, but the carelessness existing in many offices is responsible for numberless mistakes which are unnecessary and which it has been proven can, with ordinary precaution, be prevented.

There is not a freight station in the country at which the agent will admit having sufficient help. And in many cases the help allowed is insufficient. The writer has noticed, however, that little or no effort is made by the agent to economize his force and to so arrange his work that the best results may be obtained. Many stations now rushed to death could, with no additional help, handle much more work than they are now handling, by simply rearranging the work. Where a more economical adjustment of the office work will not solve the problem and relieve an office, additional help should be asked for and insisted upon. If, as should be the case, the business of the station shows an increase, the superintendent's attention should be called to the fact, as should that of the division or general freight office, together with any other good arguments that present themselves. Do not present a request for more help with poor reasons or insufficient cause, the superintendent must be shown that it is needed, as he must show officials higher up. So many good positions are open to experienced railway men outside the railway service that if the railways are to keep their best men the old practice of working them eighteen hours a day can not be continued.

In many offices telegraph operators are stationed whose spare time is unemployed, and who could be utilized to good advantage, having the effect of adding one more clerk. This should be presented to the superintendent, with information showing the need of additional help and the extent of idle time which the operator has, and no difficulty should be experienced in obtaining the use of the operator's time.

In other offices the yardmaster, or some department other than the freight department, may be usurping the time and attention of one or more of the freight office force; an appeal to the superintendent will speedily remedy such usurpation. Many an agent stands for such proceedings, being too timid to object. A certain college student paraphrased a well-known Latin passage into—"All gall is divided into three parts, Nerve, Brass and Sand." An agent needs all three in his business, and if he is too timid to stand up for his rights he has no business in the service.

The station records should include daily tonnage, revenue and classified carload reports, both inbound and outbound, and these records should be totaled once a month at least, and compared with the same period of the previous year and the increase and decrease shown. If the superintendent does not require such a detailed report it is a good thing to have on file, for it makes a good weapon to use for improvements, additional help, etc.; besides, one never knows when such information may be requested, and it is always good policy to be prepared.

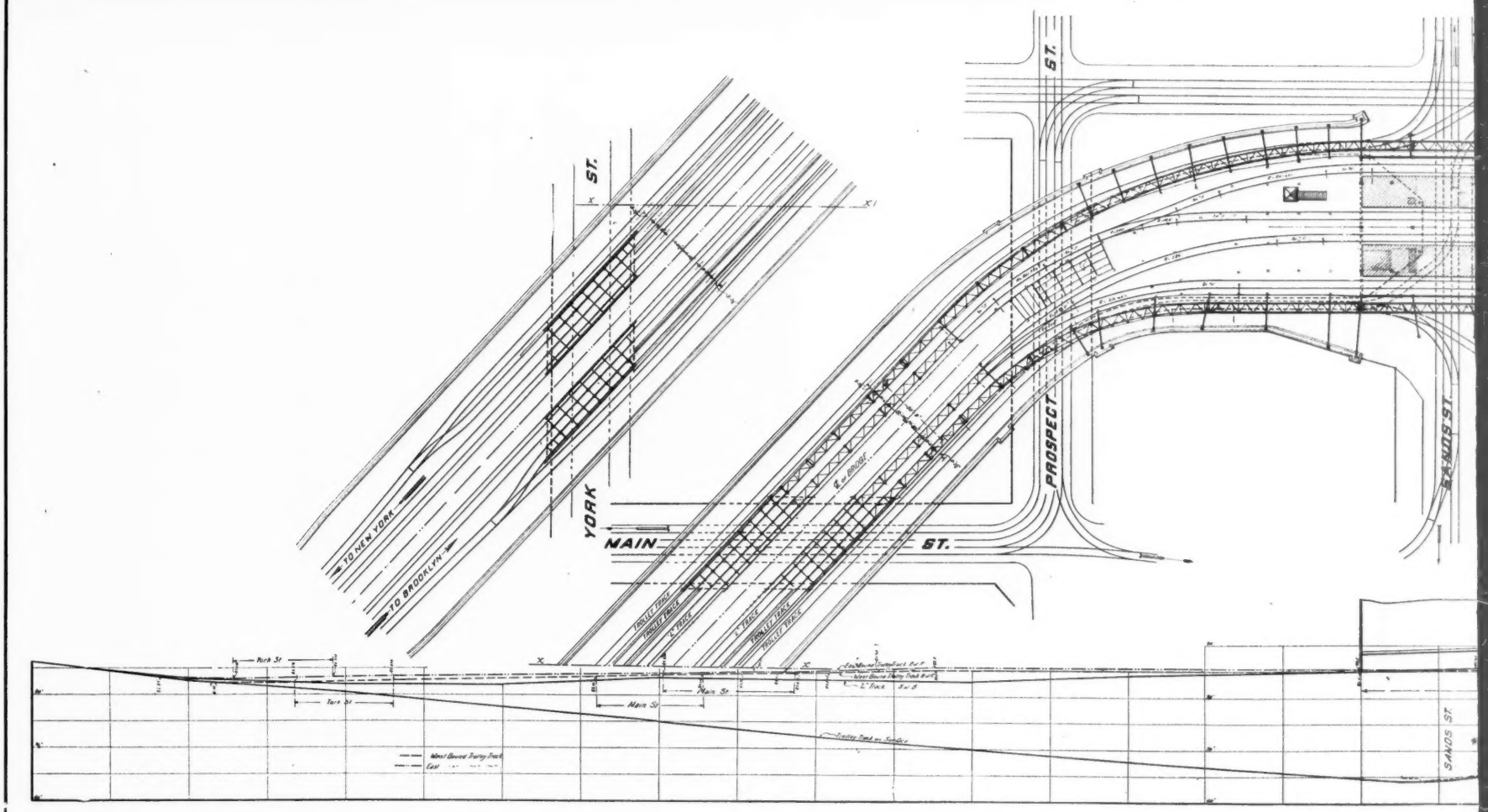
A very convenient thing, both for use in the local office and for the information of the general office, is a list of shippers and consignees, showing track accommodations, switching charges, approximate amount of business per year, most convenient delivery, etc. A few of the larger stations have issued such lists, but smaller stations have not done so, perhaps from a mistaken idea that such information is not wanted. Anything that makes for the benefit or improvement of the service is wanted.

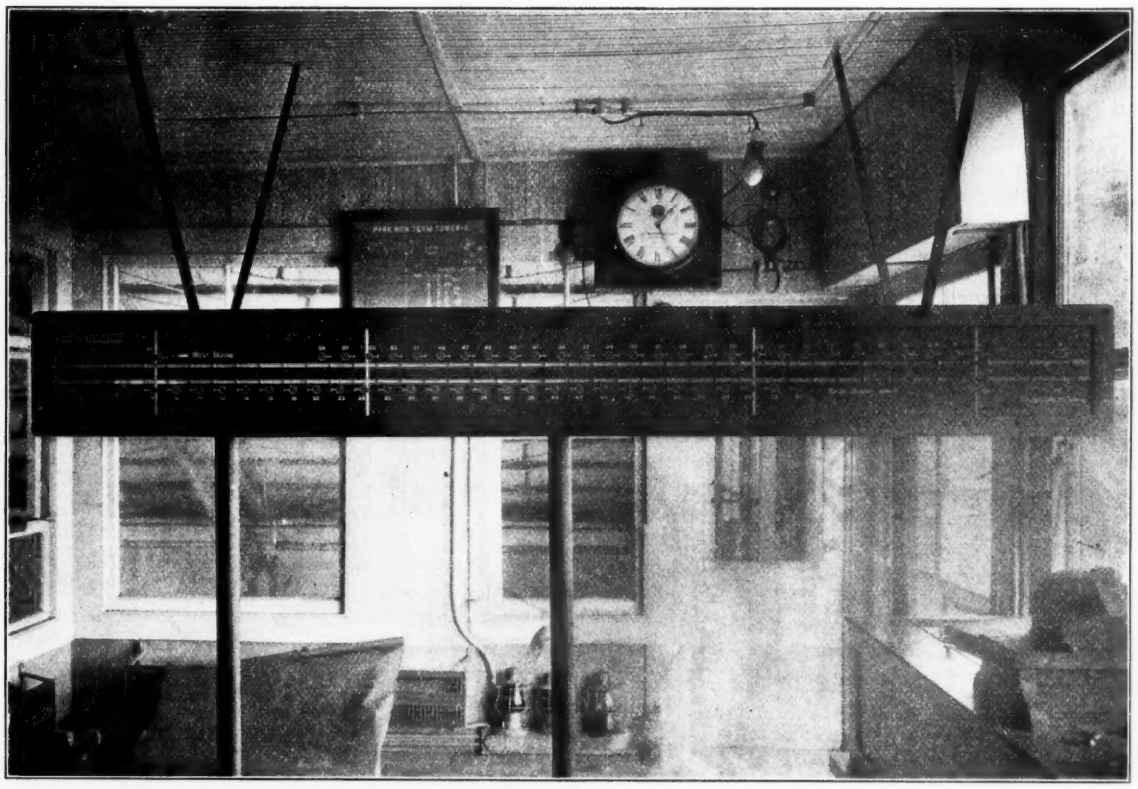
In meeting and doing business with the representatives of foreign lines and the traffic managers of industrial concerns, they should be treated with all the courtesy possible, but they have no authority over the agent and have not the right to interfere with him in the discharge of his duties, nor to give him orders. Agents at smaller stations are apt to feel that these men have this right, and will allow themselves to be led into doing things which the representatives have no right to ask. Such representatives bear about the same relation to an agent as a shipper or consignee and are entitled to the same consideration and no more.

When a customer does not understand the working of a proceeding you are forced to take time, stop and explain it to him and try to satisfy him that it is correct. Railroading is not a thing that can be picked up over night, but requires years of careful training. Therefore, do not be surprised or show disgust if your customer does not grasp the gist of your explanation at once—remember how you worked and sweated in an effort to understand a much simpler matter when you first took up railroading; remember also how many years you have been trying to understand these things yourself and how little you really know about them even now.

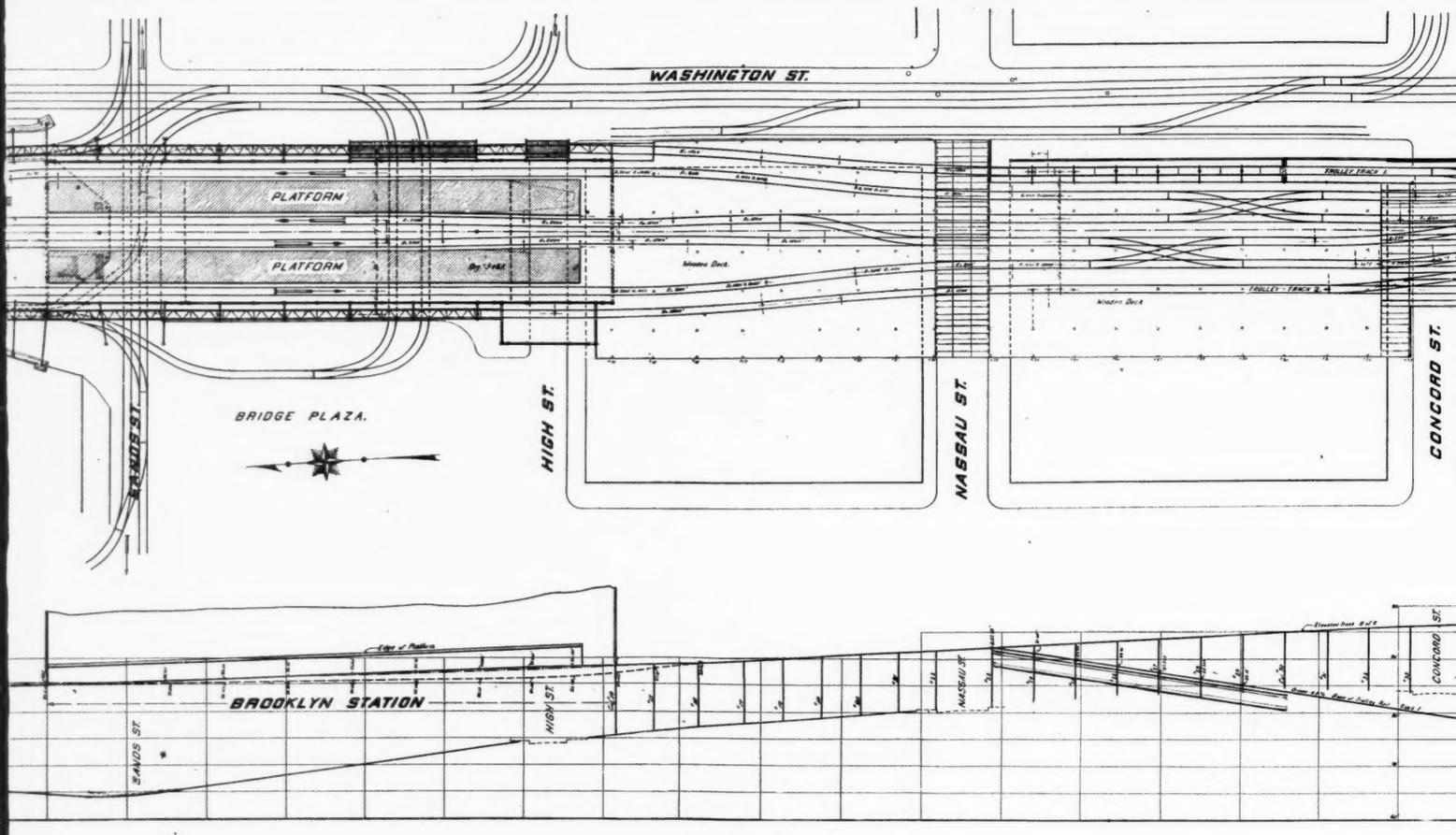
Had the officers and agents of railways taken a little more care to see that the public was enlightened as to the everyday working of railway matters and had not rebuffed almost every effort for information, it is doubtful if they would be to-day facing a situation full of distrust, suspicion, resentment and adverse legislation.

The switching engines on the Danish State railway, with few exceptions, have no fireman, the engineman doing the firing. These engines are small and their boilers are low, making it comparatively easy to keep a look-out.

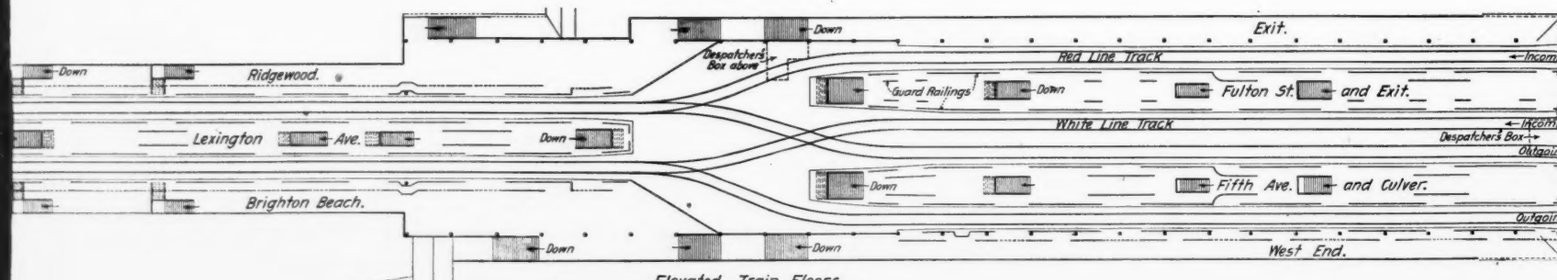




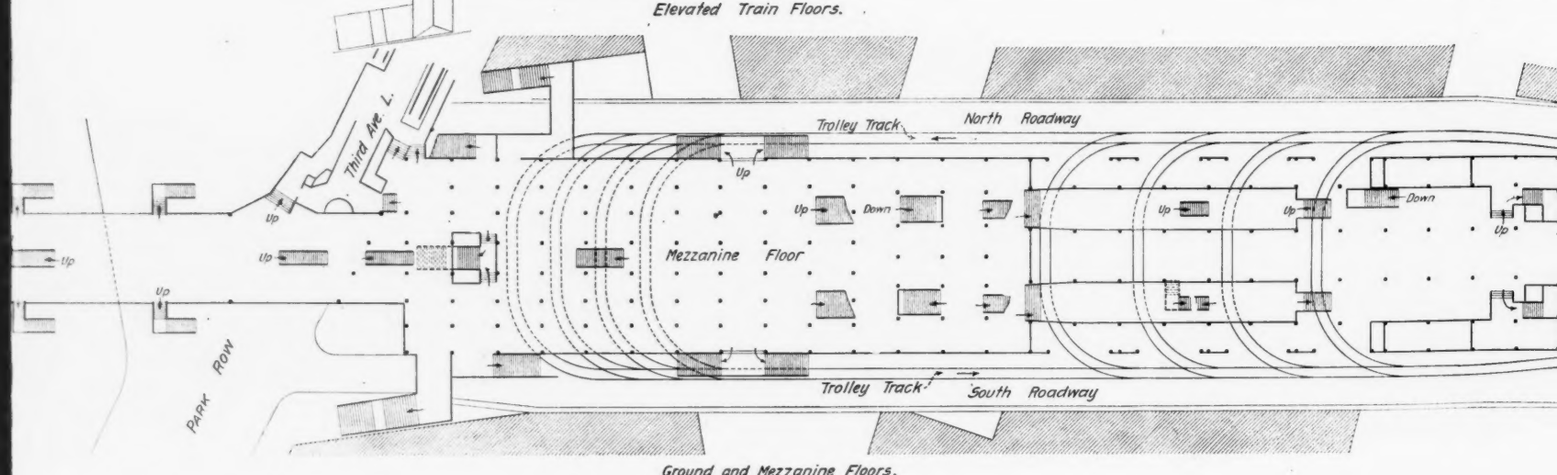
Track Model in Despatcher's Box in the Manhattan Terminal.



Brooklyn Yard and Station.

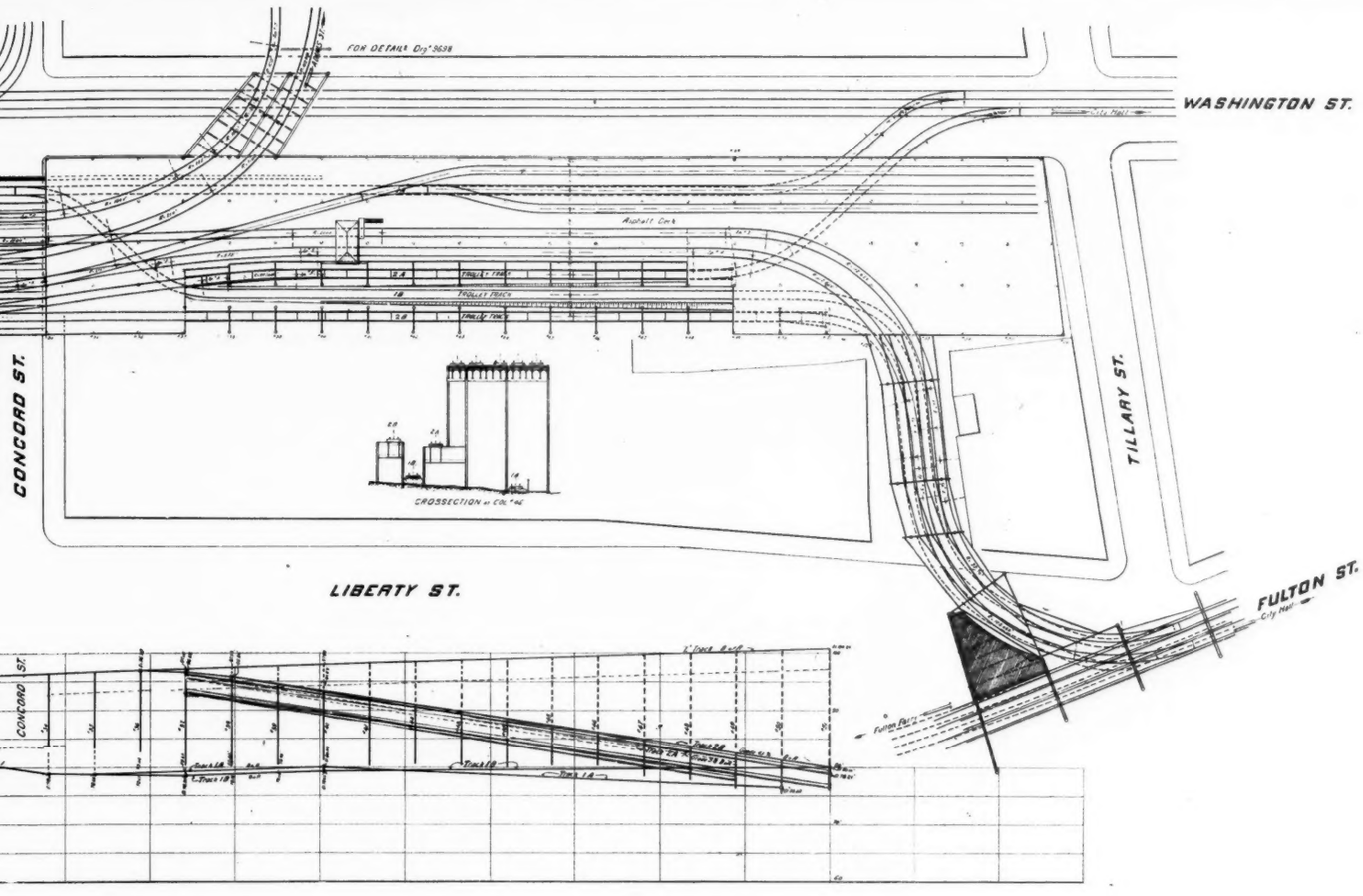


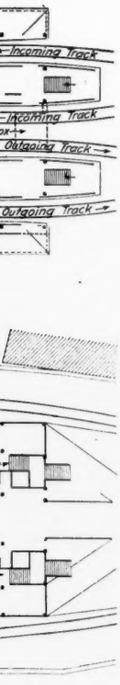
Elevated Train Floors.



Ground and Mezzanine Floors.

Manhattan Terminal; Brooklyn Bridge.





Brooklyn Yard and Station; Looking West from Despatcher's Tower.
Manhattan Bridge, now under construction, is seen in the distance.

TRAFFIC ON THE BROOKLYN BRIDGE, NEW YORK CITY.

BY F. VAN Z. LANE, C.E.
Assistant Engineer in Charge of Traffic, Department of Bridges, City of New York.

[WITH AN INSET.]

The Bridge Department of the City of New York and the Brooklyn Rapid Transit Company have completed the transit improvements which were begun on January 27, 1908, when through elevated train service replaced the shuttle service over the Brooklyn bridge. As a result of these improvements, the present operation of elevated trains and surface cars over the bridge is probably as good an example of high class railway operation as can be found anywhere when traffic density, capacity, safety, comfort, speed and uniform operation are considered together.

From a traffic standpoint, the Manhattan terminal, the Brooklyn bridge and the Brooklyn yard must be considered as parts of a span, for each depends upon the other in considering the fundamental traffic problem. All three were worked up to, and must now be maintained at, their respective maximum capacities to have a maximum elevated train and surface car movement between Manhattan and Brooklyn. As the evening rush hour, from 5 to 6 p.m., presents the greatest problem, this period will be considered in emphasizing some of the features that make this capacity traffic movement possible. The elevated train and surface car operations present two distinct and independent kinds of service and they will be treated separately.

ELEVATED TRAIN SERVICE.

The elevated train service over the Brooklyn bridge during the hour from 5 to 6 p.m. consists of 6-car multiple control trains, operated from nine different points in Brooklyn, entering the Brooklyn yard over two tracks, where they are routed and despatched to Manhattan over the single westbound track on the bridge. On entering the Manhattan terminal, all trains are run on one of two tracks, served by two unloading platforms. After unloading, the trains are switched to one of six loading platforms, from which they are despatched to Brooklyn over the single eastbound track on the bridge to the Brooklyn yard, where they are separated and despatched to their various destinations over two eastbound tracks. It will be readily seen, therefore, that the Brooklyn yard, the bridge and the Manhattan terminal each plays an important part in the transportation problem and that a small delay within the limits of any one of these three will have a serious effect on the others. During the rush period, the schedule maintains a continual line of trains under one-minute headway. The trains entering the Brooklyn yard are brought in from nine different points and despatched so as to operate over a single track across the bridge.

The capacity of the Brooklyn bridge determines the capacity of the terminal. The railway is at present operating 61 trains per hour in each direction over the bridge, and the entire traffic problem is based upon this figure. The block signal system, which was installed under the direction of the New York Department of Bridges by the Union Switch and Signal Co., Swissvale, Pa., was described in the *Railroad Age Gazette* of August 28, 1908. The word capacity in this connection bears a direct relation to the other mentioned fundamental features; those of safety, comfort, speed and consistency. Of these, safety must be given first consideration, and it is this that has determined the bridge capacity. At present the terminal and yard are consistently up to the bridge capacity.

The Manhattan terminal, shown on the accompanying inset, consists of three floors. The ground floor, or surface car level, is 580 ft. long x 135 ft. wide; the second, or mezzanine, is 515 ft. long x 91 ft. wide on an average; the third, or elevated train floor, is 780 ft. long x 91 ft. wide on an average. Within the limits of this terminal, some 61 six-car elevated trains from nine different lines and over 300 surface cars from 16 lines, carry about 50,000 people during the rush hour from 5 to 6 p.m., 42,000 of which are going in one direction. The first, or surface level, is devoted entirely to surface cars. The mezzanine floor acts as a distributor to the elevated train platforms on the floor above. Tickets are purchased on this mezzanine floor and also deposited in one of the several chopping boxes which control the entrances to the several platform stairways. By this arrangement, all passengers who have reached the elevated train floor are not further concerned regarding their tickets. The train floor consists of a gauntlet track layout, with six loading platforms and one purely unloading platform, while one of the loading platforms is also used for unloading trains. Three of the loading platforms are of the island design.

The problem of bringing this elevated train terminal up to the capacity of the bridge during the rush hour period did not necessitate the providing of more tracks, but rather merely the altering of them, so as to have a freer movement of trains as well as to provide for a quick unloading, loading and starting of the train. This latter consideration is probably the secret of the maximum train operation obtained. Since the despatcher at all times knows the position of the trains on the road, he can obtain the maximum efficiency in train movement if conditions permit his moving the train at the proper time. As the platforms of the Manhattan terminal are always crowded during the rush period, in order to have a train leave on the despatcher's signal, provision must be made for closing the train gates a few seconds previous to the time of starting the train. This is accomplished through a system of guard railings, seen on the accompanying plan of this floor, which make narrow passageways along which passengers must move. These also permit closing the train gates when the cars are filled. Through the system of the despatcher's signals to the guards, these gates are closed a few seconds before the time of starting the train. This provides time for the conductor's bell signal, indicating that train gates are closed, to be passed from the rear of the train to the motorman by the time the despatcher is ready for the train to start.

On account of variations in stairway and roof column locations in arranging the guard railings on the loading platforms, each opening had to be treated independently, and often each presented a different problem. Generally, however, a double row of railings was installed, the second row overlapping the openings of the first, which prevent a possible crowding from the rear. The space between these railings is about four feet and the passengers form in double column as they advance toward the entrance of the cars. This arrangement assists very materially in the loading of trains in a minimum time, which is necessary in order to maintain the schedule of 61 trains per hour.

It is not always possible to place the trains of a given line on the same side of an island platform and in order to avoid confusion, an electric announcer is installed on all island platforms. This signal is controlled by the despatcher, who signals to the platform guards and the passengers are thus permitted to arrange themselves in case of trains being placed other than their accustomed position. All trains are announced by hand operated semaphore arms, which indicate both the name of the line and the track on which the train will be placed for loading. The racks which house these arms are located in the center of the platforms, and an announcer is connected to the despatcher's office. In addition to these train indicators, illuminated glass signs on the respective platform display markers corresponding with those carried on the leading car of a train. The switches and semaphores in the Manhattan terminal are electro-pneumatically controlled from two different towers, the locations of which are shown in the accompanying plan. The incoming and out-

going switches are thrown by the despatcher in the tower at the entrance of the terminal who decides upon the location of every train. The switches which control the tracks into the pockets in the west end of the terminal are controlled from the small tower near the crossover. These switches as well as all others in connection with the bridge operation are equipped with electric detector locking instead of mechanical detector bars.

Illuminated track models showing the two tracks across the bridge are placed in the despatcher's towers in the Manhattan terminal and also in the Brooklyn station. The fronts of the models are of glass and divided into sections, each representing one track section on the bridge. Each model contains 78 sections, each of which is lighted by a one-c.p. 55-volt incandescent lamp. Each section indicates, when lighted, that the corresponding track section is not occupied. When, however, any section remains dark, it indicates to the towerman that the corresponding track section on the bridge is occupied by a train. Signals corresponding to those on the bridge are painted on the model in their proper positions, the whole arrangement presenting to the towerman the entire layout in miniature. These models were designed and installed by the Union Switch & Signal Co., in conjunction with the block signal installation. By this arrangement, the despatchers know at all times the exact position of those trains which are not in the terminal or in sight of the towers. In addition to controlling the movement of all outgoing and incoming switches, the despatcher in the Manhattan terminal sounds all signals for the movement of trains in the terminal. This despatcher has two assistants, one who operates the blue platform lights and the train announcer, and the other who is in telegraphic and telephonic communication with the rest of the line in Brooklyn. This man also records the arriving and leaving time of all trains.

The trains are operated on a schedule which must be maintained, since only a small delay will cause a number of passengers to gather on the loading platforms, making it necessary to close the iron gates which control the entrances to the platforms. The solution has been the supplying of a large number of trains and keeping them moving as fast as the passengers arrive.

In case of a breakdown on any line, a so-called gap train is sent to the Manhattan terminal to replace the disabled train, as it is necessary to provide immediate accommodation for the passengers who have gathered on any one platform. There are three of these gap trains held in readiness in the Brooklyn yard, and are put into service by the Brooklyn despatcher.

All ticket booths in the Manhattan terminal are equipped with signals which may be used to announce the necessary cessation of ticket selling, when it becomes advisable to temporarily stop the entrance to the loading platforms, resulting from the delay of any train. In case of a prolonged delay, the passengers who have gotten to the loading platform may be transferred to the surface lines on the ground floor. This same plan is also used in the Brooklyn station in case of a block on the westbound track over the bridge.

With the old arrangement of gauntlet tracks over the bridge, the destination in the Manhattan terminal of all trains, was decided upon by the despatcher in the Brooklyn yard, and this at a disadvantage, as he could not quickly learn of the exact position of the trains in the Manhattan terminal. In the present arrangement of single tracks over the bridge provision is made for the final destination of trains in the Manhattan terminal by the despatcher located there, so that the jurisdiction of the despatcher in the Brooklyn yard terminates after he has successfully sent all trains through the Brooklyn station.

The present plan of operation permits 61 six-car trains per hour to cross the Brooklyn bridge in each direction, or 122 trains per hour through the Brooklyn yard, which schedule must be maintained during the rush hours in the morning and evening.

SURFACE CAR SERVICE.

The surface cars of 16 different lines converge at the bridge and are operated over a single westbound track on the north roadway of the bridge to the ground floor of the Manhattan terminal. On the first level of this terminal, as shown in the accompanying plan, are eight loops where the surface cars discharge and receive their passengers. The cars are then returned to Brooklyn over a single eastbound track on the south roadway of the bridge.

The Manhattan terminal and the Brooklyn exit and entrance must be considered, as well as the bridge itself, in attaining and maintaining capacity service over the surface lines. The loops in the terminal and the tracks on the bridge can be maintained at their capacity only by a construction which prohibits a congestion of cars, such as formerly resulted on the Brooklyn side. This congestion was caused by vehicles which use the same thoroughfares to and from Brooklyn as the car lines. During the rush hour periods, more than 300 cars, and nearly as many vehicles entered and left each roadway of the bridge at Sands street, where there were several tracks crossing each other. This new arrangement was put in operation on September 28, 1908, and not only relieves the congestion at the entrance of the bridge, but has resulted in cutting down the running time of cars while on the bridge about 33⅓ per cent. At present these cars run from the Manhattan terminal to Tillary street, Brooklyn, in the same time that it formerly required to make a trip from the Manhattan terminal to Sands street and they make the round trip from Tillary street to Manhattan terminal in 18 minutes.

Reference to the plan and elevation of the Brooklyn yard and station shows the arrangement of tracks. Formerly all surface cars entered and left the bridge at Sands street. This brought them into contact with the cars and vehicles approaching and leaving the bridge resulting in a slow movement in both directions, which affected the entire system. To overcome this, additions were made to the yard structures, which provided additional tracks from a point near the Brooklyn anchorage to continue part of the surface cars on the yard structure, over Sands street, through the yard to a point beyond Concord street before returning them to the surface. In like manner some of the cars are delivered to the bridge at the Brooklyn anchorage from Concord street.

The Coney Island & Brooklyn Railroad, which operates 16 per cent. of the cars over the bridge, was formerly responsible for about 50 per cent. of the delays. These delays were due mainly to poor equipment, but at the present time this equipment is in first class repair and the percentage of delays caused by the cars of this company does not exceed the percentage of its cars operated over the bridge, which condition should be maintained by all lines.

The remedying of these two defects, that of relieving congestion of surface lines by running part of the cars over the yard structure and that of keeping equipment in first class repair, together with a regulation prohibiting heavily laden vehicles from crossing the bridge during rush hours has done most toward bringing the surface car service on the bridge up to capacity. The average number of cars operated during the rush hour increased from 221 in February, 1907, to 319 during the same period in 1909. The delays due to defective equipment have been reduced from 456 minutes in February, 1907, to 136 minutes in February, 1909. There were 93,437 surface cars operated over the bridge in February, 1907, which makes 44 seconds per 100 cars, while there were 112,078 cars operated in February, 1909, which makes but 7¼ seconds per 100 cars. This is considered a remarkable showing. It is now possible to operate over 300 surface cars per hour through the Manhattan terminal by running at a fairly high rate of speed, but if this speed is exceeded, collision with

other cars or with vehicles is possible. As many as 357 cars have been operated over the bridge per hour.

The locating of several inspectors and police on the terminal and roadways has also had much to do with the smooth operation of these cars. These inspectors keep the vehicles in the roadway, as well as seeing to it that motormen maintain their cars at the best possible speed. Boxes containing wrecking tools, fuses, etc., are located at the end of the bridge at the towers and anchorages and push cars are distributed at frequent intervals to be used in case of breakdown. Provision is also made for promptly removing disabled or dead horses from the bridge. Telephones installed in each tower permit immediate communication with the despatching boxes in case of trouble. The track on the north roadway has been continued some 30 ft. beyond the last loop and disabled westbound cars may be laid up on this track while awaiting the arrival of a wrecker or for a quieter period during which to move them to the shops. Former practice in this regard was to use the last loop for this purpose, but this proved poor practice, since it resulted in taking that loop out of the service and causing a great deal of confusion among the passengers, with consequent delay to cars.

The surface car terminal on the ground level in the Manhattan, consists of eight loops between the north and south roadway. The loops are sufficiently long to accommodate two cars, one on each side, leaving a passageway along the center line of the bridge for the use of pedestrains on their way to the promenade. The four lower loops are close together and the loading and unloading is carried out simultaneously on account of the limited space between them. The upper loops are further apart, which permits the north side to be used for unloading, and the south side for loading. The main problem of operation on this level is to keep the loops free so that a car will not block the main line. In order to accomplish this, the starter is located so that he can see all incoming trains and he notifies by signal the inspector on each loop when a car is approaching. The inspector then sees to it that any cars which may be standing there are sent out. Through this arrangement, these loops will accommodate about 58 cars per hour. The first one of the upper loops is used for the bridge local, a surface car which makes a round trip between the Brooklyn and Manhattan terminals. Entrance to the cars on this line is controlled by an enclosure and all tickets are purchased before entering.

The difficulties in the transportation problem here involved can be best understood from these figures. Of the 300,000 passengers carried over the bridge every 24 hours, 50,000 of them go during the rush hour from 5 to 6 p.m., moving in one direction. To meet this demand an average of 61 six-car elevated trains, and an average of 305 surface cars leave the Manhattan terminal during the rush hour from 5 to 6 p.m., or a total of 671 cars per hour. The excellent results shown were obtained by the co-operation of the Brooklyn Heights Railroad Company and the Department of Bridges of which James W. Stevenson is the commissioner and C. M. Ingersoll was chief engineer.

HANDLING COMPLETE BRIDGE SPANS.

The Lehigh & New England has just rebuilt its single-track bridge over the Delaware river at Portland, Pa., the work being now finished, except for some painting. The bridge consists of six 150-ft. riveted deck trusses, Cooper specification E50, replacing that number of old pin-connected trusses. The new spans are assembled nearly complete some distance from the bridge site. If they were erected under traffic on the bridge piers, it would require continuous false work, which would be expensive and also dangerous. The work being done in winter, the false work might at any time be carried away by ice, the new span under erection be lost, and traffic tied up for want of a bridge. As a matter of fact, the ice did go out of the river recently, but no damage was done, the only false work being the towers at the piers, and these, being on the down-stream side, were fully protected.

The first plan considered for doing the work without continuous false work was to put transverse girders through the old truss, fastening them to angles riveted to the end posts, and on the projecting ends of these cantilevers erect the new truss. When complete, the old and new spans could both at once be moved transversely on skids, the new truss taking the position of the old one. This plan was not followed, as the old trusses were not strong enough. The plan adopted was to assemble the new span off the bridge, bring it into position over the old truss and hang it from gallows frames. The old truss was then moved out sidewise and the new truss lowered into position.

Fig. 1—New Span on the Way to Position.

Each new truss was erected in a yard about a quarter of a mile from the bridge site. The ties were laid on it and the other assembling was complete, except for the rails, the shoes and the sway bracing at the end panel points. The weight of a single span is about 150 tons, while the ties weigh about 15 tons more. It was hauled to the bridge site on a pair of special trucks, as shown in Fig. 1. Double A-frames were mounted on the trucks, and the end floor beams of the truss rested on swing bolsters at the tops of these frames. Between the yard and the bridge there is a curve with a 3½ in. superelevation. This superelevation had to be reduced to 2¼ in. because of the height of the center of gravity of the truss when mounted on the trucks. The new

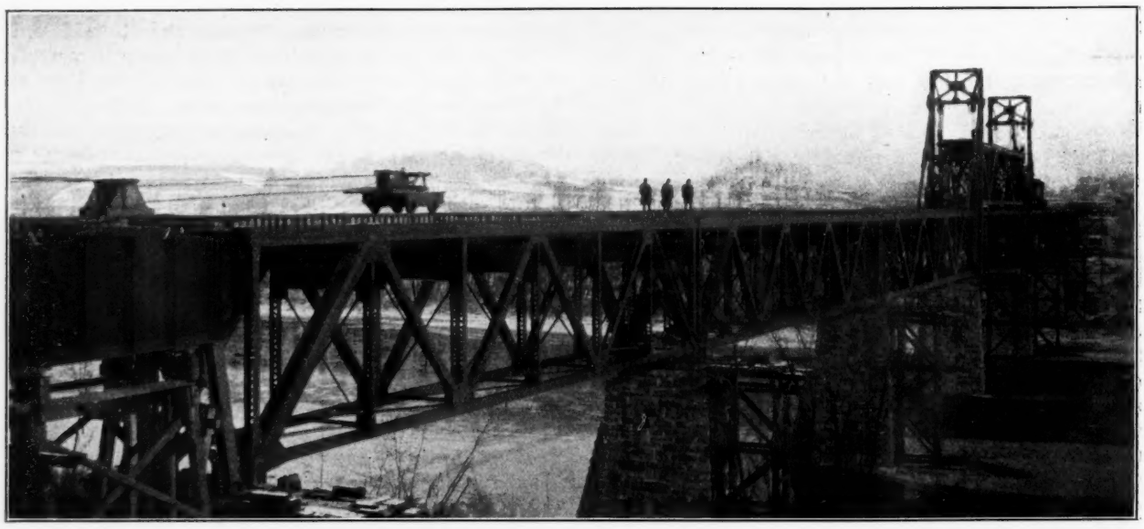


Fig. 2—New Span Hoisted Clear of Trucks; Old Span Still in Place.
Looking east; equalizer in foreground.

Fig. 3—Old Span Moved Out and New Span Ready to be Lowered.
Looking east; equalizer at extreme right.

Fig. 4—New Span in Place.

span was brought into position under the gallows frames over the old span, made fast to four sets of 6-sheave blocks, and hoisted clear of the tracks. The blocks were made fast to the bridge by pin-connected knuckles. The upper portion of the knuckle was integral with the block and the lower portion was bolted to the end post of the bridge during erection in the yard. This made the attaching of the blocks to the bridge span quick and simple, the blocks being simply lowered to position and the pins inserted. After the span was hoisted clear, the shoes were pinned on and the sway bracing at each end put in place. The rails on the old bridge had previously been cut at the ends of each span and angle bars put in. When the new truss was in position over the old truss, these angle bars were removed. The old truss was then slid out sidewise on transverse beams and rails resting on the false work alongside each pier. The old trusses were so light that no rollers were needed.

The four lines from the sheave blocks were all carried to one of the gallows frames, then down to idler pulleys at track level, and thence along the bridge to an equalizer, mounted on a four-wheel truck. Another set of 6-sheave blocks connected the truck carrying the equalizer to a fixed block bolted to the floor system, the fall lines from these blocks running directly to the hoisting engine. When the new truss was first raised from the trucks on which it was carried from the yard, the equalizer was about 50 ft. from the fixed block. As the truss was lowered, the equalizer moved towards it, its total

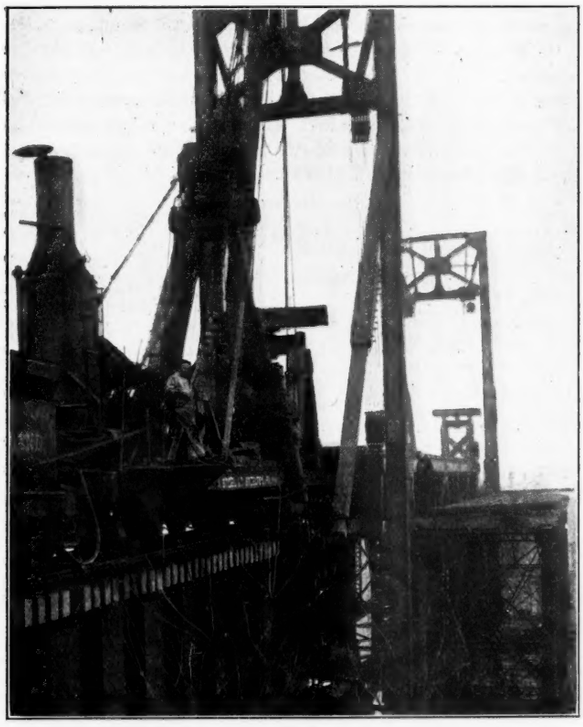


Fig. 5—New Span Lowered Part Way.

travel being about 300 ft. By this system, the four sets of blocks from which the truss was suspended were lowered evenly. The equalizer and fixed block are shown in the foreground in Fig. 2. This arrangement required three or four hundred feet of tangent track. As the east approach to the bridge is on a curve, the hoisting engine and tackle had to be used first from one side and then from the other, accordingly as the truss being handled was near the curved approach or not. In Fig. 3, which shows the placing of a truss near the west end of the bridge, the hoisting engine and tackle are on the east end, the equalizer being visible in the distance. In Fig. 2, where work is under way on a truss in the middle of the river, this arrangement is reversed. When the new truss was in final position, the same rails which had been used on the old span were put in place. In one case, a new truss was put in position two hours after leaving the yard, and was ready for traffic as soon after as the rails could be relayed and the derrick car and other apparatus got out of the way. In this case it took 30 minutes only from the time the moving out of the old span was started to the time the new one was down in place. On the average, it took eight days to erect one truss and put it in place.

To take care of the old truss, outriggers were made fast to the new truss at each panel point and the old truss suspended

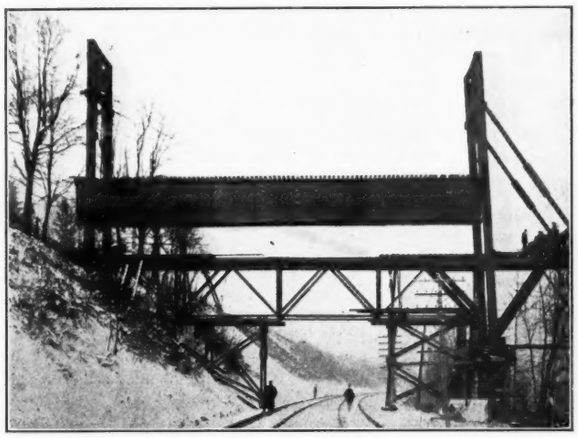


Fig. 6—Placing Approach Girder Span.
Rails and ties partly removed from old span.

from them. The old truss was then wrecked, one panel at a time, and the members handled by a derrick car and loaded into cars. The gallows frames were moved to position for handling the next truss as follows: Transverse 12-in. x 16-in. x 20-ft. timbers were placed on the derrick car under the blocks bolted to the posts of the gallows frame. One of these blocks can be seen in Fig. 5 near the lower right-hand sheave block. The derrick car boom was then made fast to the upper part of the gallows to steady it, and the whole frame raised by jacks under the transverse beam. The car then moved forward and placed the frame in its new position on the pier ahead.

The work of rebuilding the bridge included the replacement of a trestle approach on the east end consisting of 30 30-ft. deck plate girders and two 50-ft. deck plate girders on steel bents, which were handled in the usual manner by derrick car. The west approach span over the Delaware, Lackawanna & Western tracks, however, was handled by the gallows frames. Fig. 6 shows this 105-ft. deck girder span, fully assembled, about to be put in place. The ties, rails and sway bracing were removed from the old span, and the new span was then dropped between the two old trusses. The old trusses were then taken out with two derrick cars and dismantled in the yard.

The Pennsylvania Steel Company, Steelton, Pa., had the contract for fabricating, erecting and installing the new bridge. It is interesting to note that the vertical posts of the gallows frames had previously been used in the erection of the Blackwell's Island bridge at New York. H. Denburger, Supervisor of Bridges and Buildings of the Lehigh & New England, who was in general charge of the work, under J. A. Zehner, General Superintendent, is responsible for the scheme adopted for putting the new trusses in place, the actual plans for which were drawn by M. G. Hilpert, Assistant Engineer of Erection for the Pennsylvania Steel Company. J. A. Johnson was General Foreman in the field for the steel company. We are indebted to Mr. Denburger for the foregoing description and photographs.

LOCOMOTIVE SPRINGS.*

BY J. A. KINKEAD.

Until recently each spring maker has been a law unto himself. All springs were furnished to a given load and length under a more or less severe guarantee; in most cases even the kind of steel was not specified. With this arrangement the manufacturer used such number, width, thickness of plate, as well as pitch, as seemed best to him. Had all spring makers been working with the same constants, fairly uniform results would have obtained. As, however, the several spring makers used F. S. varying from 70,000 to 90,000, and modulus of 28 to 32,000,000, a replace spring ordered to the same length and load might be entirely different from the original spring in the three vital points, number, width and thickness of leaves, if supplied by a different maker, and might vary as widely as their action in service. This irregularity caused so much confusion and annoyance that many users of springs now calculate their own springs, and specify not only the length and capacity, but also the number, width, thickness of leaves, and height of their springs. In this connection the American Locomotive Company has issued a table derived partly from G. R. Henderson's tables, but differing from them in deflection of full elliptic springs. These tables are given herewith.

AMERICAN LOCOMOTIVE CARD.

"Spring tables for semi-elliptic springs give the capacity of one plate 1 in. wide and different thicknesses.

"To obtain the required number of plates, multiply the figure given in 'Load' column by the width of spring in inches and divide the required capacity by the result. The quotient gives the number of plates required.

"*Note.*—Where quotient gives decimal more than 3 add one plate to the whole number.

"The number of full length plates must be 25 per cent. of the whole number required; other plates must be regularly shortened.

"The deflection given in table is the difference between free and loaded height, irrespective of width or number of plates; for full elliptics number of plates and deflection given is for each half of spring."

SPRING TABLES.—*Semi-Elliptic Springs.*

One plate 1-in. wide.

Length between cent'rs.	¼-in. plate Load.	Deflection.	⅜-in. plate Load.	Deflection.	½-in. plate Load.	Deflection.	⅝-in. plate Load.	Deflection.	¾-in. plate Load.	Deflection.
20	167	0.98	260	0.78	...	....	...	....	...	....
22	152	1.19	235	.95	341	0.79	...	....	...	....
24	139	1.41	217	1.13	312	.94	...	....	...	....
26	128	1.66	200	1.32	288	1.10	393	.95	...	....
28	119	1.92	186	1.53	268	1.28	365	1.10	...	....
30	111	2.20	173	1.76	250	1.47	341	1.26	...	....
32	...	....	163	2.00	234	1.67	319	1.43	...	....
34	...	....	153	2.26	220	1.88	301	1.62	...	....
36	...	....	144	2.53	208	2.12	284	1.81	372	1.53
38	...	....	...	....	197	2.35	269	2.03	350	1.76
40	Formulas used in....				187	2.60	255	2.24	333	1.95
42	Computing table.....				178	2.87	243	2.47	317	2.16
44	$P = \frac{53{,}333\,H^2}{L}$				170	3.15	232	2.71	303	2.37
46					163	3.45	222	2.96	290	2.58
48	$F = .000611\,\frac{L^2}{H}$....				156	3.75	213	3.22	277	2.82
50	... .				...	....	204	3.49	266	3.06
52	P = net static load..				...	....	197	3.78	256	3.30
54	F = deflection.				...	....	189	4.08	247	3.57
56	H = thickness plate..				...	....	...	....	238	3.83
58	L = length bet. cen..				...	....	...	....	230	4.12

With American Locomotive Company's tables the deflection for full elliptic springs is considered as double that of semi-elliptic springs, whereas Henderson made allowance for one-quarter of the leaves in semi-elliptic springs being full length. Henderson's tables thus show deflection for full elliptic springs about 10 per cent. greater than double the deflection for semi-elliptic springs.

Another subject open to discussion has been the effect of the band. Some engineers in their calculations consider the total length the distance between supports less the width of the band; *i.e.*, the metal under the band is considered inactive and hence neglected in the calculation. This is equivalent to using a higher f. s. and a greater modulus. In order to determine the effect of the band I tested a spring made of plates tempered perfectly straight in order to eliminate such variables as camber and "truck" or greater curvature of the shorter plates. This spring when tested first without, then with band, gave the same deflection for 80,000 f. s. but slightly less deflection without the band at 160,000 f. s., indicating that the width of the band may be neglected in calculations.

Fiber Stress.—The f. s. is eliminated in two ways: First—elastic limit, which is again subject to two variables, kind of materials and heat treatment; second—conditions of service, as overload on the springs. Tests recently made on the B. & M. show that overload is often 40 per cent., and sometimes as much as 60 per cent. The recognized standard spring steel, P. R. R. analysis, with .90 to 1.10 as tempered commercially, has an elastic line of about 160,000 lbs. per sq. in. With conditions as noted above on B. & M., a F. S. of about 80,000—*i.e.*, one-half the elastic limit should be satisfactory.

Modulus.—The modulus is without doubt the same for all wrought iron and steel, irrespective of heat treatment or alloys used. The variations shown in diagram No. 2, which was plotted by T. D. Lynch, of Westinghouse Electric & Mfg. Company, from results obtained with Ewing Extensometer reading to .000064 per inch of length, was plotted in that way merely for convenience, as the actual readings were the same for all materials, viz., 1A, O H steel as rolled; 1B, O H steel, oil tempered and annealed; 1C, O H steel, oil tempered, etc.

The variations in results of tests recently made at Baldwin Locomotive Works, which are given below, are due more to very slight irregularities in the readings rather than to actual differences in the modulus.

Report, June 24.

		Elastic limit.	Modulus.
17	Annealed in lead at 1400 deg. F.....	78,500	27,550,000
	Hardened in oil at 1450 deg. F.:		
11	Drawn to 560 deg. F.....	137,500	28,700,000
14	" " 500 "	160,400	27,150,000
19	" " 400 "	177,600	29,080,000
12	Not drawn	187,400	28,610,000
	Hardened in water at 1425 deg. F:		
16	Drawn to 1050 deg. F.....	180,700	28,070,000
13	" " 900 "	233,900	28,860,000
15	" " 750 "	240,800	29,220,000 Broke
20	" " 600 "	219,800	30,420,000 Broke
18	Not drawn	212,000	29,960,000 Broke

The same might be said of result obtained by Fairbairn (in manufacture of iron) as follows:

Strength of Steel to Resist Transverse Strain (Jeans).

Manufacture.	Modulus of elasticity.
Naylor, Bicker & Co.....	30,278,000
S. Osborn & Co.	27,482,000
C. Sanderson Bros.	29,973,000
T. Turton & Sons.	30,294,000
J. Brown & Co.....	30,370,000
C. Cammell & Co.	29,166,000
H. Bessemer & Co.	29,810,000
Titanic Steel & Iron Co.	31,901,000
Haematite Steel & Iron Co.....	28,754,000
Heaton Steel & Iron Co.....	28,605,000
Mean	29,663,000

For all practical purposes it should be found satisfactory to use a modulus of 30,000,000, as unavoidable variations in width and thickness of leaves, not to mention length and camber of leaves, would entirely nullify a change of modulus, which change would also render practically useless the work done by Henderson and others.

Reference was made above to the effect of difference of camber. Although differences of camber in two springs do not affect the maximum working load or deflection of the springs, yet differences of camber in leaves of the same spring may make a very material difference in the life of the spring.

The usual method of making a semi-elliptic spring in railway shops is as follows: Heat and bend the main plate to

*Abstract of paper read before Canadian Railway Club, Montreal, Can., February, 1909.

a little less than the specified height of the finished spring, and after tempering, use the main plate as a templet for the next. The second plate is given more curvature than the main, and is then used as a templet for the third, each plate being fitted to the preceding one by hand or rolls. It is customary with most spring makers, and even specified by some users, to give each successive leaf a little more curvature, so that when piled for banding they will all separate at the center. With some, considerable difference is made in the first few plates, the others made to fit as closely as possible. When the band is applied, and the plates all brought together, an additional camber, or negative load is given to the main plate and an equal strain put on the short plates. Again, the main plate will not carry its share of the load until returned to its original camber. It is readily seen that the final result is a negative load on the main plate and a positive load or strain on the short plate varying with the total amount of set taken up in banding. In this way a strain of from 10 to 40 per cent. of their working load may exist in the short plate caused by the band alone. When such a spring goes into service, the overload the spring is always subject to results in early failure of the short plates. The relative failures of short and long plate was found by one road to be about 5 to 1, while another road replaced broken short leaves with untempered leaves on account of excessive breakage. Where there is an average difference of $\frac{3}{8}$ in. between each plate, it is readily seen the strain that would be put on the short plates. It is undoubtedly much better practice to have the plate fit, then the band performs only its natural function of keeping the plates in line.

Material.—The steel used for springs in the earlier days was graded by fracture only, and made by the cementation or crucible process. The grade used for springs would show possibly .50 per cent. carbon. Steel of this character is used for springs in England and Europe to-day, as indicated by recent analyses of Krupp and Steel, Peach, Tozer spring steel given below:

	Carbon.	Silicon.	Phosphorus.	Sulphur.	Manganese.
Krupp	.54	.35	.068	.059	.573
Steel, Peach, Tozer..	.68	.19	.063	.050	1.112

The steel used most largely in this country has come to be known as "Pennsylvania Analysis," and was introduced by Dr. Chas. B. Dudley. This requires carbon .90 to 1.10, manganese not over .25, and copper, phosphorus and sulphur not over .05.

With these two widely varying kinds of steel, the Pennsylvania and Steel, Peach, Tozer, it is possible, by different heat treatments, to get approximately the same elastic limit, but for the same heat treatment the former will, of course, give much the higher results. Under usual conditions, the low carbon steel is hardened in water, while the high carbon steel is hardened in oil. This difference in treatment should give practically the same elastic limit to both steels, in which case it would be interesting to learn which would give the best service. I know of two roads using both kinds of steel, but unfortunately the careful record of spring service necessary to make satisfactory comparison is lacking. From tests made on single plate with steel showing about .60 carbon, it was found that when the elastic limit was as high as is usually obtained with the higher carbon, the plate would break at slightly above the elastic limit. The higher carbon steel with the same elastic limit will bend to 45 deg. at least without breaking.

A growing interest is being taken in alloy steels. A number of the French roads use Wolfram or Tungston steel in their driving and truck springs; the automobile builders are using various alloys such as silicon, chrome-vanadium, chrome-nickel and others. In connection with alloy steels, I would like to call your attention to a comparative test of vanadium steel showing carbon .35 and vanadium .17, with Pennsylvania steel, carbon, 1.13. The springs were P. R. R., class E 100, 16 plates, 5 in. x ½ in., centers 36 in., and calculated load 29,160 lbs. The vanadium spring was given a load of 92,000 lbs., and took ½-in. set. It was then given 94,000 lbs. three times without taking any additional set. The elastic limit is seen to be about 85,000 lbs.

The P. R. R. spring was given a load of 89,000 lbs., taking a set of 1⅛ in., then 85,000 lbs., taking ¼ in. more set, then at the application of 89,000 lbs. eight plates broke. This spring shows an elastic limit of 65,000 lbs. There is no question as to the relative merits of these two springs, but the results are incomplete in that check tests have not been made to verify the original tests.

Flexibility.—Flexibility is the all important point in spring design, and has received the least attention from spring makers and users. Springs are used in construction on account of their flexibility, and within reasonable limits their value varies directly as their flexibility. Great care is taken to see that springs are the right width, or length, or strength, or height, and little or no attention paid to their prime function, flexibility. It seems unreasonable to say that many spring failures are due to excess strength, but this is the case. The original springs applied to a class of engines were 28-in. center, nine plates 6 x $\frac{7}{16}$ in., with calculated capacity of 19,700 lbs. Identical springs except having 10 plates instead of nine, were applied to engines of a similar design. In each case the springs were entirely unsatisfactory, and were replaced by springs having 16 plates 4 x ⅜ in., and 17 plates 6 x $\frac{5}{16}$ in. respectively. These springs gave satisfactory service, although 3,000 lbs. lower in calculated capacity; or, in other words, 3,000 lbs. weaker. In comparing the springs it is seen that the length was unchanged, and the width unchanged in that 6-in. plates were used in the second replace springs. The one marked difference is the flexibility. By substituting thinner leaves the factor, load per inch deflection, was lowered 30 per cent. Expressing the flexibility in terms of load necessary to produce 1 in. deflection, the $\frac{7}{16}$-in. plate gave 18,000 and 19,000 lbs., the ⅜-in., 13,000 lbs., and the $\frac{5}{16}$-in., 12,000 lbs. per inch deflection.

On the showing of these four springs, I do not hesitate to recommend that the flexibility be checked up in all cases of excessive spring failure, and where the calculated load divided by deflection exceeds 15,000 lbs. substitute longer springs or thinner plates.

Similar instances have been brought to my attention which bear out the above assumption. In one instance four leaves were added to a spring, one at a time, thinking failures were due to weakness. With each additional leaf the failure increased.

Testing.—The last point in the treatment of this subject is testing. It is generally conceded that seeing is believing, but in the usual testing of semi-elliptic springs this is not the case. Theoretically a spring will show uniform deflection under proportionate loads within the elastic limit of the material, irrespective of whether the load is applied or released. In practice the friction between the leaves results in a deflection less than calculated for applied loads and greater than calculated for released loads. Furthermore, a spring under a given load may stand at any height between the heights of applied and released loads or for any given height balance at any load within the curve for their height. For this reason a spring may seem to carry a given load at a given height in the testing machine when by slight changes in local conditions the spring will carry the same load at a height varying ⅜ in. either way.

With driving springs the variation in height under working load due to friction alone will be ⅜ in. to ⅝ in. Two springs are designed to carry 25,000 lbs. at 1 in. height. If no mention is made of manner of testing, both springs would be within the $\frac{3}{16}$ in. allowance usually given, one on released load and the other on applied load. but the first would be a half-inch or more too high in service, and the second would be as much too low. With any change in load the friction

present is absorbed before there is any apparent motion of the spring. This friction under ordinary conditions will be from 2,000 to 4,000 lbs. If the plates are oiled, or covered with paint or other lubricant, it may be only one-quarter that amount. This action of semi-elliptic springs is the reason of their easy riding, the friction acting as a dampener to prevent excessive vibrating. The friction between the leaves is overcome by slight blows or vibration of any kind causing a change in the applied and released lines. In this way by blow of fist an apparent change of 300 to 500 lbs. can be made in the spring.

With semi-elliptic springs it is satisfactory to order to the height under applied load allowing ⅜ in. variation over, or to height under release load allowing ⅜ in. under required heights. To my mind the latter is to be preferred, as it is more constant and more easily taken.

Failures.—I attribute spring failure to the following:

First.—Bad fitting, resulting in failure of short plate.

Second.—Overloading, due to incorrect weights, high speed on improperly banked curves, low joints, bad switch points or crossings, and improper brake application. A majority of failures are due to abuse of the springs in this way. One serious lot of failures seemed mysterious until it was discovered that trouble was due to drop engines took in running on and off the turntable at the roundhouse.

Third.—Lack of flexibility.

Fourth.—Bad tempering.

Fifth.—Lopping, or letting down under load.

In conclusion, I should like to suggest:

First.—Increase in flexibility, particularly in cases of excessive failure where load per inch deflection is high.

Second.—Work to either applied or release loads in testing, and not leave this point open, as is usually done.

Third.—Fair criticism of failures, so that responsibility is not put on designer or maker when trouble is due directly to bad roadbed or miscalculated loads.

Fourth.—Careful record, mileage or time, of service of spring, in order to locate the cause of failures and be in position to apply proper remedy.

HIGH STEAM-PRESSURES IN LOCOMOTIVE SERVICE.

BY W. F. M. GOSS,
Dean of the College of Engineering, University of Illinois.

V.

VIII. CONCLUSIONS CONCERNING BOILER-PRESSURE VS. BOILER CAPACITY AS A MEANS OF INCREASING THE EFFICIENCY OF A SINGLE-EXPANSION LOCOMOTIVE.

26. *In the preceding chapters an analysis has been given showing the saving* which may result in locomotive service, first, by increasing the pressure, the boiler capacity remaining unchanged, and second, by increasing the heating-surface, the pressure remaining unchanged. A summary of the conclusions of these chapters is presented in Figs. 16 to 21 in which the full line represents the gain through increase of boiler-pressure and the dotted line the corresponding gain through increase of boiler capacity. The values for these diagrams are taken directly from Tables 5 and 7. It will be seen that starting with pressures which are comparatively low, the most pronounced results are those to be derived from increments of pressure. With each rise in pressure, however, the chance for gain through further increase diminishes. With a starting-point as high as 180 lbs., the saving through increased pressure is but slightly greater than that which may result through increased boiler capacity.

The fact should be emphasized that the conclusions above described are based upon data which lead back to the question of coal consumption. The gains which are referred to are measured in terms of coal which may be saved in the development of a given amount of power. It will be remembered that conditions which permit a saving in coal will, by the sacrifice of such saving, open the way for the development of greater power, but the question as defined is one concerning economy in the use of fuel. It is this question only with which the diagrams (Figs. 16 to 21) deal.

There are other measures which may be applied to the performance of a locomotive which, if employed in the present case, would show some difference in the real values of the two curves (Figs. 16 to 21). The indefinite character of these measures prevents their being directly applied as corrections to the results already deduced, but their effect may be pointed out. Thus, the extent to which an increase of pressure will improve performance has been defined, but the definition assumes freedom from leakage. If, therefore, leakage is allowed to exist, the result defined is not secured. Moreover, an increase of pressure increases the chance of loss through leakage, so that to secure the advantage which has been defined, there must be some increase in the amount of attention bestowed, and this, in whatever form it may appear, means expense, the effect of which is to reduce the net gain which it is possible to derive through increase of pressure. Again, in parts of the country where the water-supply is bad, any increase of pressure will involve increased expense in the more careful and more extensive treatment of feed-water, or in the increased cost of boiler repairs, or in detentions arising from failure of injector, or from all these sources combined. The effect of such expense is to reduce the net gain which it is possible to derive through increase of pressure. These statements call attention to the fact that the gains which have been defined as resulting from increase of pressure (Figs. 16 to 21) are to be regarded as the maximum gross; as maximum because they are based upon results derived from a locomotive which was at all times maintained in the highest possible condition, and as gross because on the road, conditions are likely to be introduced which will necessitate deductions therefrom.

The relation which has been established showing the gain to be derived through increased boiler capacity is subject to but few qualifying conditions. It rests upon the fact that for the development of a given power a large boiler will work at a lower rate of evaporation per unit area of heating-surface than a smaller one. The saving which results from diminishing the rate of evaporation is sure; whether the boiler is clean or foul, tight or leaky, or whether the feed-water is good or bad, the reduced rate of evaporation will bring its sure return in the form of increased efficiency. An increase in the size of a boiler will involve some increase in the cost of maintenance, but such increase is slight and of a sort which has not been regarded in the discussion involving boilers designed for higher pressures.

Keeping in mind the fact that as applied to conditions of service the line *A* is likely to be less stable in its position than *B*, the facts set forth by Figs. 16 to 21 may be briefly reviewed.

Basing comparisons upon an initial pressure of 120 lbs., (Fig. 16), a 5 per cent. increase in weight, when utilized in securing a stronger boiler, will improve the efficiency 8.5 per cent., while if utilized in securing a larger boiler, the improvement will be a trifle less than 3 per cent. Arguing from this base, the advantage to be derived from an increase of pressure is great. If, however, the increase in weight exceeds 10 per cent., the curve *A* ceases to diverge from *B* and if both curves are sufficiently extended, they will meet, all of which is proof of the fact that the rate of gain is greatest for relatively small increments of weight.

Basing comparisons upon an initial pressure of 140 lbs. (Fig. 17), the relative advantage of increasing the pressure diminishes, though on the basis of a 5 per cent. increase in weight it is still double that to be obtained by increasing the capacity.

Basing comparisons upon an initial pressure of 160 lbs. (Fig. 18), the advantage to be gained by increasing the pres-

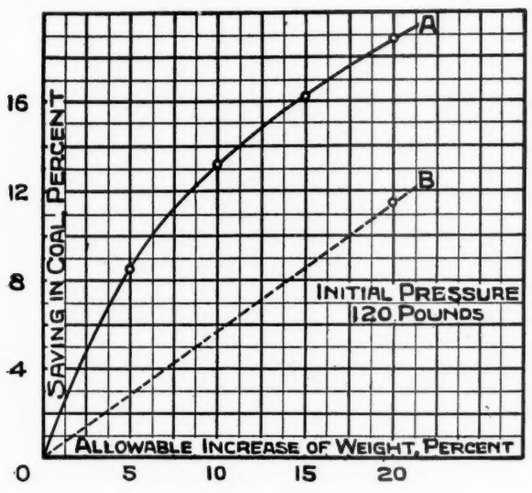


Fig. 16.

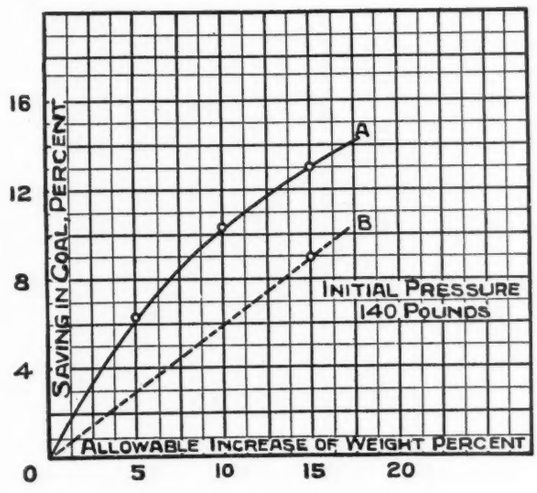


Fig. 17.

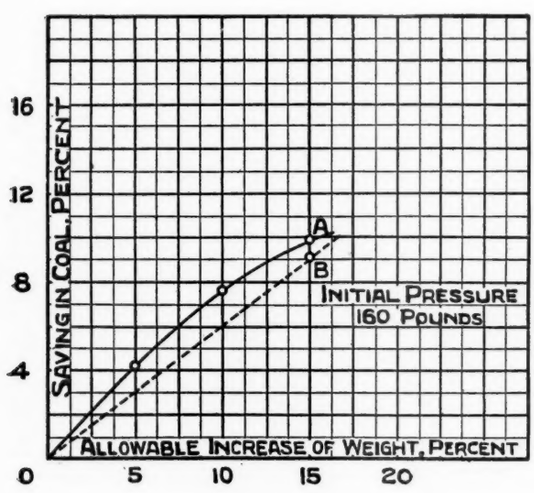


Fig. 18.

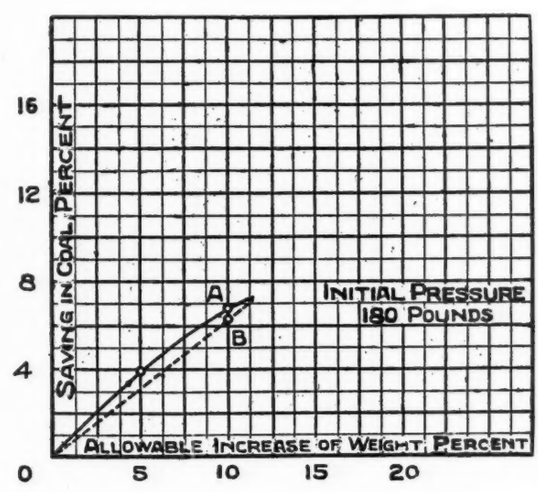


Fig. 19.

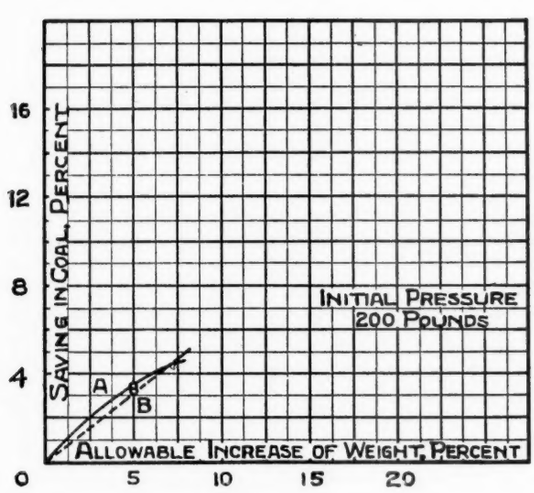


Fig. 20.

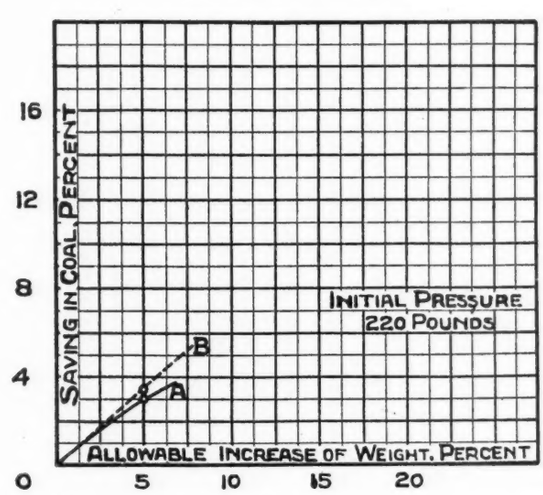


Fig. 21.

The Lines A Represent the Saving in Fuel When an Allowable Increase in Weight Is Utilized in Making a Stronger Boiler to Permit a Higher Pressure.

The Lines B Represent the Saving in Fuel When an Allowable Increase in Weight Is Utilized in Making a Larger Boiler to Give Increased Capacity.

sure over that which may be had by increasing the capacity is very small, so small in fact that a slight droop in the curve of increased pressure (*A*) would cause it to disappear. As the curve *B* may be regarded as fixed, while *A*, through imperfect maintenance of boiler or engine, may fall, the argument is not strong in favor of increasing pressure beyond the limit of 160 lbs.

Basing comparisons upon an initial pressure of 180 lbs., (Fig. 19), the advantage under ideal conditions of increasing the pressure, as compared with that resulting from increasing the capacity, has a maximum value of approximately one-half of 1 per cent. In view of the incidental losses upon the road the practical value of the advantage is nil. The curves *A* and *B* (Fig. 12), constitute, therefore, no argument in favor of increasing pressure beyond the limit of 180 lbs.

Basing comparisons upon an initial pressure of 200 lbs., (Fig. 20), it appears that under ideal conditions either the pressure or the capacity may be increased with equal advantage, this being in effect a strong argument in favor of increased capacity rather than of higher pressure.

Basing comparisons upon a pressure of 220 lbs., (Fig. 21), it appears that even under ideal conditions of maintenance the gain in efficiency resulting from an increase of pressure is less than that resulting from an increase of capacity. In view of this fact, no possible excuse can be found for increasing pressure above the limit of 220 lbs.

THE USE OF STEEL IN PASSENGER CAR CONSTRUCTION.*

BY JOHN McE. AMES.

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The primary cause of the introduction of steel in passenger construction, I take to be the idea of safeguarding the passenger against fire and accidental injury from telescoping and other causes. Nearly every wreck of wooden coaches carries with it a harrowing tale of suffering from fire, and many legislators have agitated the question of compelling the railways by law to provide the traveler with non-combustible conveyances. The advent of electricity as motive power increased materially the danger from fire and in order to avoid conditions such as existed in the Paris underground accident, the question of non-combustible coaches was brought forcibly before those railways intending to enter New York by sub-river tunnels. Here the danger from smoke would be nearly as great as from fire itself.

Before the death of that far-sighted executive of the Pennsylvania system, the late Mr. Cassatt, he decided that with the completion of the tunnel system into New York, none but steel coaches should be used in tunnel service and preparation according to his policy is being rapidly brought to completion. These sub-river tunnels have, therefore, been factors in the introduction of steel in coach construction, but the primary idea is nevertheless the safeguarding of the passenger. The growing scarcity of long timber for sills and the reduction in cost of maintenance of steel over wooden cars may both be considered as minor causes in the introduction of steel.

We know then why steel should be used, but the question occurs to many as to *where* steel should be employed and where it is unnecessary. Opinions differ regarding interior finish, roof, doors, headlining, floors, windows, etc. To attain the safeguarding of passengers there is no question but that steel should be used for underframe, posts, carlines, etc., or that steel or metal exterior should be used in order to avoid fire from outside causes. But is it necessary to make the interior of similar material even if it can be and is being done? The statement is often heard among railway men, "If we are going to build of steel, let us build a coach entirely of steel without even a splinter of wood." This expresses the sentiment prevalent to-day, but I do not believe the result obtained by the elimination of *all* wood, compensates for the increased cost and loss of insulating qualities, nor it is necessary for the safeguarding of the passenger. In order to apply steel both inside the coach and out, every piece of metal must be either bolted or riveted in place, requiring much ingenuity to so design that rivets may be driven. The alternative is to rivet the outside plates to the frame and then attach the interior plates by means of machine screws tapped into posts and carlines. This generally proves an easy but sad solution, for vibration and unequal expansion soon loosen the tap screws and out they come like tacks driven into plaster. A few wooden furrings bolted to posts, belt rails or carlines, entirely covered on the outside by the steel construction, on the inside by the finish and head lining, which may be well fastened thereto by wood screws, offers a much cheaper, neater and unobjectionable method of construction except for the sentimentalist who wishes to eliminate the last splinter of wood. Aluminum or a slow burning artificial board certainly should be permitted to replace steel for headlining, partitions and interior pier covers. I should not advocate the use of steel for window sills or arm rests on seat ends. These parts soon loose their paint, due to constant elbowing, thus presenting an untidy appearance and should be made of wood. The use of steel for roofs adds to the weight of the coach as at least ⅛-in. material is required when roofs are to be walked on while icing and filling tanks. The greatest care must be taken with joints of the roof sheets to avoid leakage. Good results are obtained by lap joints, both edges of which are welded to the adjacent plate by oxy-hydrogen or other process. This is all expensive work and there is doubt whether the result is enough better than canvas covered artificial board to warrant the additional expense. If, however, we are to safeguard the passenger, steel must be used for roofing in order to protect him from external fire in cases where a coach is overturned. Steel should not be used for roofs where power is taken from overhead wires, as it would prove too dangerous to employees. If steel is used in a case of this kind, it should be provided with a substantial insulating covering which will, of course, again add weight to the car. Floors are another difficult proposition in a steel coach. Passengers should not be asked to walk on a slippery steel plate, even if carpet covered and, therefore, some other surface must be provided. Magnesium cement has been largely used, but could be substituted by interlocking rubber or cork tiles, both of which are insulating and slow burning. Steel alone should not be used for floors, but should be used on the lower surface especially with electrically-driven trucks. The use of steel or brass for window frames seems like a waste of metal in view of the fact that heat from without, if severe enough, may break the glass, and even though the wood should ignite, there is not enough of this material in the frame to produce any serious result. The same may be said of doors if fitted with glass, otherwise steel should be used for doors as a protection against fire in adjoining coaches. From the builders' standpoint, the chief reason why wooden window frames should be used is that each frame may be fitted to place and a tight joint obtained in spite of unequal window openings due to camber, uneven metal work, etc. Steel for moldings is to-day the accepted practice and a good product is obtainable in cold-drawn metal, but here again must be provided wood furrings to which the moldings may be attached by wood screws or else the undesirable tap screw, or similar device is required. Steel is good, but not essential for partitions and seat frames. I believe the evolution of the steel coach will produce a more composite interior than required by present demands.

The subject of paint on steel naturally comes to mind. After building a coach entirely of steel at great expense so as to safeguard the passenger against fire, the builder is often required to paint and varnish the exterior and grain the interior

*From a paper presented at the Central Railroad Club, March 12, 1909.

to resemble wood, using highly inflammable material. This is, of course, an inheritance from the wooden coach, a habit which is hard to change. Steel can be given an excellent dull paint finish which could be easily kept clean and we await some Lochinvar to lead us away from the highly-polished and inflammable finish now in vogue. Incidently the subject of noise due to the use of steel was a mooted question before any coaches were built, but anyone who has ridden in a steel coach will concede that, except for a slight drumming sound over the trucks, there is, if anything, less noise in a steel than in a wooden coach.

Having discussed *why* steel should be used in passenger construction, and *where* it should be or need not be used for safeguarding the passenger, we come to a collateral subject which must be considered along with the use of steel, namely: its insulation against heat and cold. What have we gained if, while endeavoring to safeguard our passenger from fire and wreck, we freeze him in winter and roast him in summer? I am free to confess that there is very little information obtainable on this subject of insulation. We know that steel absorbs a large amount of heat from the sun's rays, but believe that with open windows and electric fans, steel coaches will be as agreeable as the present wooden coach in summer. Winter, however, presents a different problem. A steel coach in our northern countries could be subject to an exterior temperature of 40 deg. to 50 deg. below zero and an interior temperature of 90 deg. (providing someone does not interfere with the porter) or in all a difference of 140 deg. The outside steel is tending to contract, the inside steel to expand, and both to equalize the temperature without and within the coach. This is the condition which ruins tap screw fastenings, tends to loosen rivets and destroy connections, thus warranting the use of wooden furrings, artificial board or other lining material not subject to expansion and contraction. In winter steel feels colder and in summer hotter than wood, and this is another reason why window sills and arm rests should not be made of steel. Air-tight joints are difficult to make with steel against steel and although an air space may be provided between the sheathing and lining, it is in no sense a dead air space such as is required for good insulation. Double floors should keep out the cold from below and there is little trouble with roof insulation, but the side and end framing, cut up by window and door openings, is a problem still somewhat unsolved. An attempt at insulation has been made by backing the steel lining with asbestos cloth, but joints cannot be covered as in a wooden coach and air gets through the smallest opening, thus reducing the efficiency of the asbestos backing. I do not wish to convey the idea that steel coaches cannot be heated satisfactorily, for slightly increased radiating surface over that required in wooden coaches produces the desired result, but still it is evident that the better the insulation, the less the required amount of heat, and it is along these lines that the problem should be taken up.

In guarding against leakage from rain or snow, joints must necessarily be made as tight as possible. This is done in the roof by welding or soldering the overlapping joints and in the outside of the frame by so constructing that plates and pier covers overlap so as to provide against leakage. The least opening which permits water to run down back of a plate produces a streak of rust and ruins the painters' best efforts. This can be and is overcome by proper design and workmanship and is not to be compared to the difficulty of insulating against cold.

When a railway officer makes up his mind that the safety of his passengers warrants the use of steel in his coaches, he usually asks the car building company these two leading questions:

"How much more will a steel coach cost than my standard wooden coach?"

"How much more will it weigh?"

The answers to these questions depend upon many conditions and to some extent the price is governed by the weight. The only fair way to approach these questions is to compare the weight and cost per passenger according to seating capacity. All available information in regard to steel coach weights is tabulated on page 322 of M. C. B. Proceedings, Vol. 42, and to this the officer is respectfully referred. It happens that the length of many standard wooden coaches is 60 ft. or under, the exact length having been largely governed by the longest stick available in one piece for sills. Now to substitute steel for wood in a 50 or 60-ft. coach, whose weight has been minimized by years of development, does not produce the result desired. To illustrate, reference to the table mentioned gives the weight of a 53-ft. 5¾-ft. Penna. steel coach, seating 64 passengers as 95,400 lbs., or 1,490 lbs. per passenger. Table No. 2 on page 319 of the same volume gives weight of Penna. wooden 53 ft. 9 in. coach, seating 62 passengers, as 85,000 lbs. or 1,373 lbs. each, a difference of 117 lbs. per passenger in favor of the wooden coach. On the other hand, the same table gives the weight of the Pennsylvania 70-ft. steel coach, seating 88 passengers, as 116,100 lbs. or 1,319 lbs. each and the weight of Penna. 70 ft. wooden coach, seating 80 passengers, as 106,000 lbs. or 1,325 lbs. each. Both the steel weights given include storage batteries not included in the wooden car weights. These figures illustrate the fact that when changing from wood to steel, in order to obtain true economy, the length best adopted to steel construction should be considered and a comparison then made on a basis of weight per seating capacity. An important factor which governs the cost, is the number of coaches in a given order. Designs, die work, formers, patterns, jigs, templates—all absolutely essential for steel work where wood could be cut and tried—cost as much for one coach as for 50, and unless duplicates of some standard coach already built, an order for a few steel coaches is necessarily a costly proposition. As the number in the given order increases, to some extent, the price per coach decreases, since overhead charges may then be distributed proportionately, but at best, the cost of steel is greater than wood in coaches, unless a comparison is made per passenger carried. However, the steel coach should last longer and cost of maintenance should be largely reduced.

Having determined that the use of steel will safeguard the passenger and that the price of steel compares favorably with wood, if considered on a basis of cost per passenger carried, let us not forget that the stockholder is also interested in new rolling-stock. What effect has the use of steel in passenger construction upon the railway stockholder and his dividends? We can safely say that he benefits by the use of steel, due to decrease in cost of maintenance, and longer life of coach at small increased initial expense. But how about cost of repairs in case of wreck? A wrecked steel coach presents a bad condition and repairs of this kind are much more costly than for wooden coaches. If badly wrecked, the wood coach may also burn and leave no salvage other than the metal parts. If, on the other hand, a steel coach, by not burning or telescoping, has saved the life of one or more passengers, it has served the purpose for which it was constructed and the stockholder benefits by fewer damage judgments. The railway company may well afford to scrap such a coach, obtain the salvage and purchase a new one with money saved from litigation.

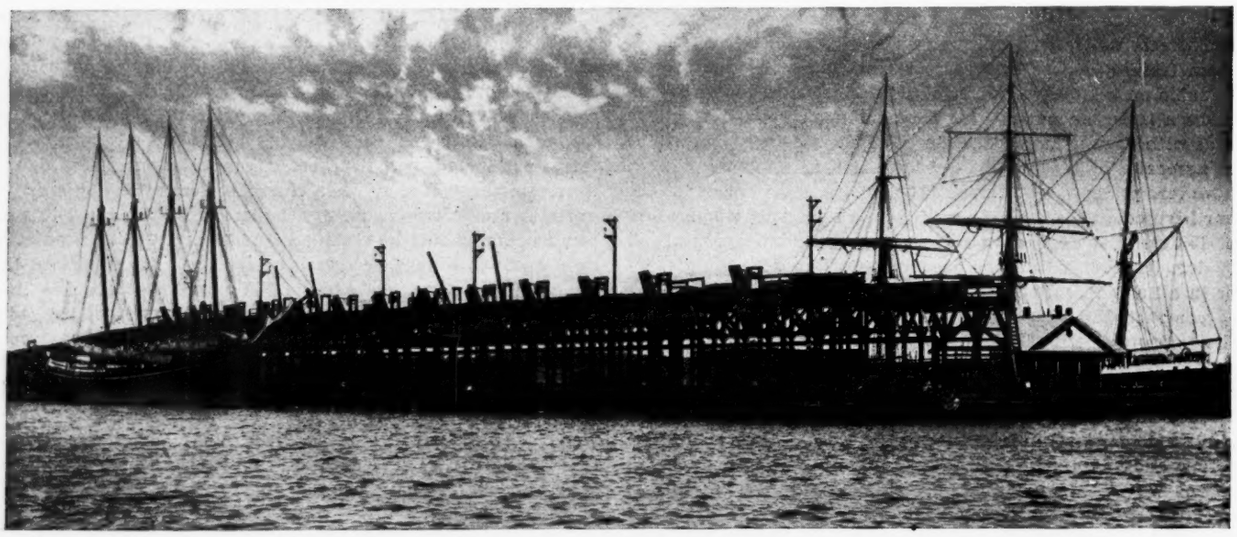
To conclude, the use of steel in passenger construction is not an experiment but a matter of daily use. It lends itself readily to the skill of the artisan and reduces risk of serious accident to the passengers. It is more available than wood, produces a plainer effect, is easy to clean and weighs no more than a wooden coach if economically designed. The initial cost per passenger carried is about the same as for wooden coaches, its maintenance considerably less. The life of a coach is greatly increased by the use of steel, and damage suits as well as suffering in case of accident greatly reduced. The use of steel in coach construction is increasing daily and is here to stay.

LOUISVILLE & NASHVILLE TERMINALS AT PENSACOLA

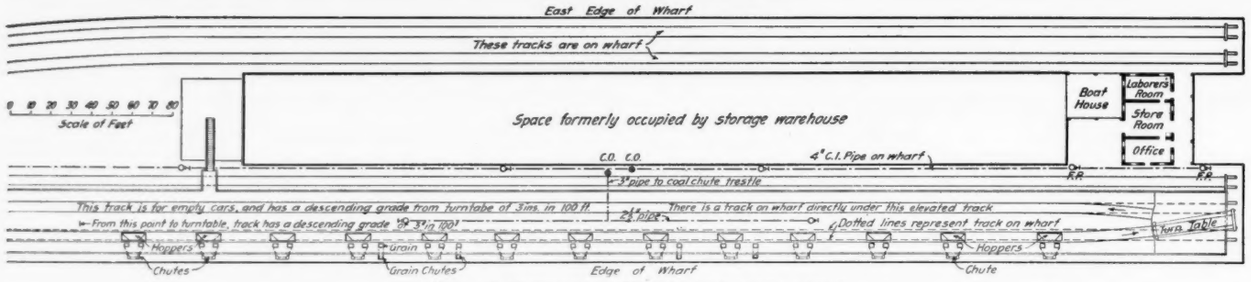
Pensacola bay is landlocked by Santa Rosa island, which is about 38 miles long, lying parallel to the main land and about two miles from it. The western end of the island is about 1½ miles from a peninsula of the mainland and the entrance to Pensacola bay is through this gap. The channel at this point is wide and from 30 to 45 ft. deep. Inside the bay, for a distance of 9 or 10 miles, the area of deep water broadens out so that there is extensive anchorage space in 30 ft. water. The city of Pensacola is about eight miles from the entrance.

The Louisville & Nashville wharves, which are in the city, were built several years ago. They are: The Muscogee wharf and coal dock, the Tarragona street wharf and the Commandancia street wharf. These wharves are reached by 28-ft. channels, 100 to 125 ft. wide, running to the deep water in the center of the harbor. Vessels drawing 28 ft. can load on both sides of the wharves. The Muscogee wharf is used mostly for coal, phosphate rock and lumber. It is 2,440 ft. long, 120 ft. wide at the sea end and 46 ft. wide at the shore end. On the lower level are five tracks and on the coal trestle above are two tracks. The trestle has 13 coal chutes and four grain chutes. These are hinged so that they may be drawn up out of the way when not in use. They have extension aprons so as to accommodate the hatches of vessels of any size. Coal cars are run out on the outer of the two elevated tracks, unloaded through the chutes and then moved to a transfer table at the end of the trestle, going back on the inner track to the railroad yards north of the wharf. Phosphate rock is loaded in the same way. Vessels may be loaded from cars on the upper and lower tracks at the same time, taking on bunker coal while loading cargo, or taking coal or phosphate rock through the chutes and miscellaneous freight from other cars on the lower tracks. Lumber is also loaded direct from the cars. Timber is usually unloaded into the water from skids near the shore end of the wharf and held in booms until needed.

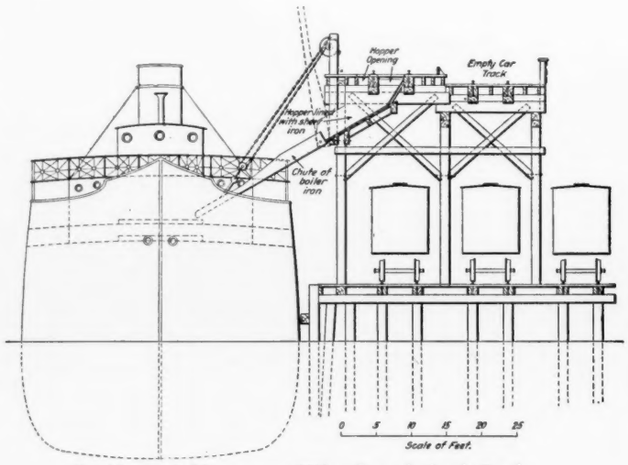
The Tarragona street wharf and the Commandancia street wharf are about a mile west of Muscogee dock. They are parallel to each other, with a slip about 160 ft. wide between them. Tarragona wharf is 1,950 ft. long and from 130 water and the rest in 15 ft. water. At the shore end is a grain elevator of 500,000 bushels capacity. A belt conveyor runs from the elevator to the outer end of the wharf through a conveyor gallery. There are two belts, each designed to deliver 10,000 bushels of grain an hour. Along the west side of the wharf are 27 grain spouts, through which grain is delivered to the holds of vessels. Grain can thus be loaded from both belts to one hold or separate holds of the same



Muscogee Wharf and Coal Dock.



Plan of Muscogee Wharf and Coal Dock.



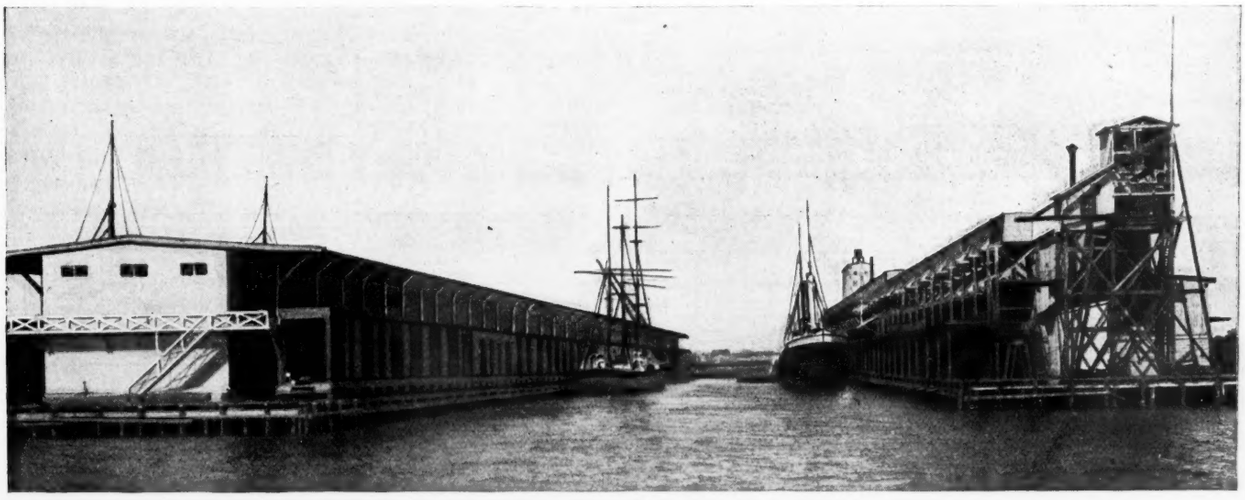
Section of Muscogee Wharf and Coal Dock.

or different steamer. There are two warehouses on this wharf, the outer one is 50 ft. wide and 404 ft. long, divided into 11 compartments. This is used for storing import freight shipped in bulk, such as salt and fertilizers. It is served by a Hunt elevated automatic railway for handling freight to or from the different compartments. The other warehouse is 50 ft. wide and 140 ft. long. This is for miscellaneous export freight. On the western side of the wharf are two tracks. Opposite the export warehouse these tracks are on different levels, so that cars may discharge to or load from vessels from both tracks at the same time. These tracks are protected from the weather by a shed 25 ft. wide. This wharf is used for all freight except coal and phosphate rock.

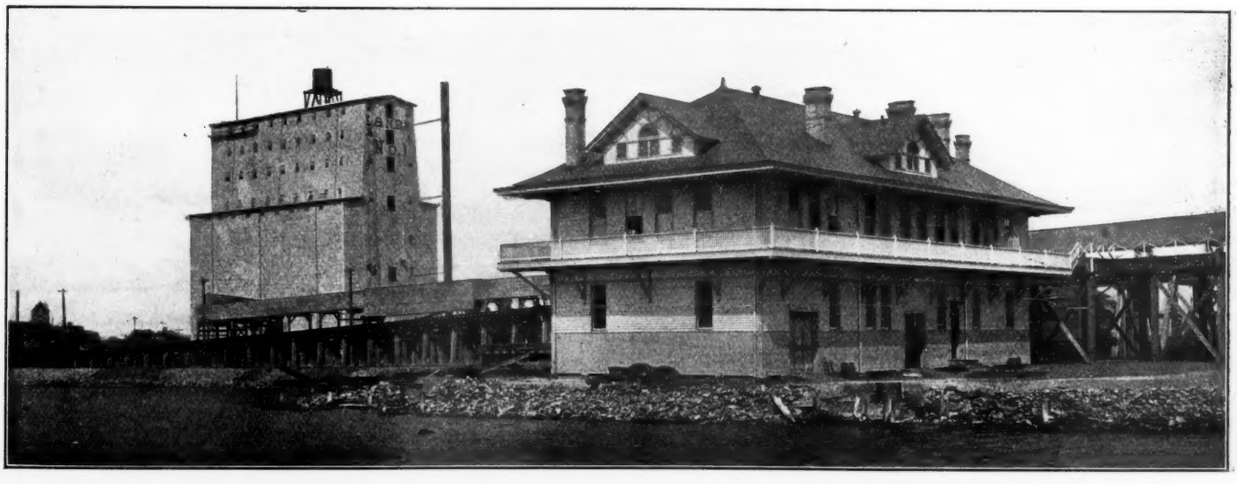
The Commandancia street wharf is the newest of the three structures. It is 2,075 ft. long and about 110 ft. wide. The warehouse is a two-story building, 1,200 ft. long and 50 ft. wide. Alongside of it on the upper story there are two railroad tracks, one on each side, and on the lower story there are three. These tracks, as well as storage space on the eastern side, are protected from the weather by sheds. As at the Tarragona street wharf, vessels can be loaded from either the upper or lower floors or from both at once, and at the same time take on bunker coal. Both floors of the warehouse are designed to carry 600 lbs. per sq. ft. The warehouse has 400 doors, each 8 ft. wide, opening vertically.

All the wharves have tracks for the temporary storage, classification, etc., of cars. In addition, there is a 1,000-car storage yard. All the wharves are built on creosoted pine piles from 60 to 75 ft. long. They are lighted by electricity and wires are arranged for extensions so that electric lights can be carried down into the holds of vessels. On each wharf there is a system of piping for fire protection and for supplying vessels with water. The fire plugs are about 150 ft. apart. There are also chemical fire extinguishers, hand grenades, fire hose, etc., and city fire alarm boxes are near at hand. The switch engines used on the wharves are supplied with fire pumps and the company's employees have regular fire drills.

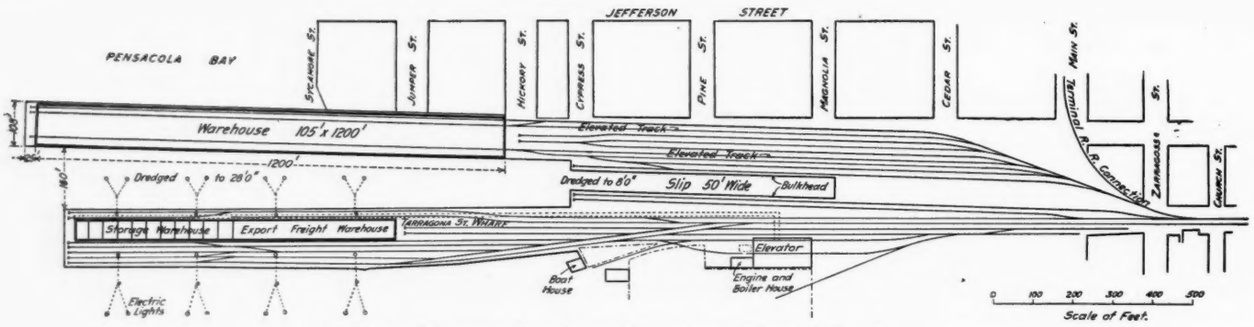
Before the Louisville & Nashville improvements were made, the only export business of Pensacola was that originating in nearby territory, being mostly lumber and naval stores. Nearly all of it was handled in sailing vessels. The result of the improved facilities is shown in the following table of exports from the city during the calendar year 1907. The L. & N. brings to Pensacola cotton from five states, coal and iron from Alabama and Tennessee, phosphate rock from Tennessee, yellow pine from Florida and Alabama, and grain and packing house products from connecting railroads in the Middle West. Since no attempt has been made to serve other than southern territory with imports, the principal



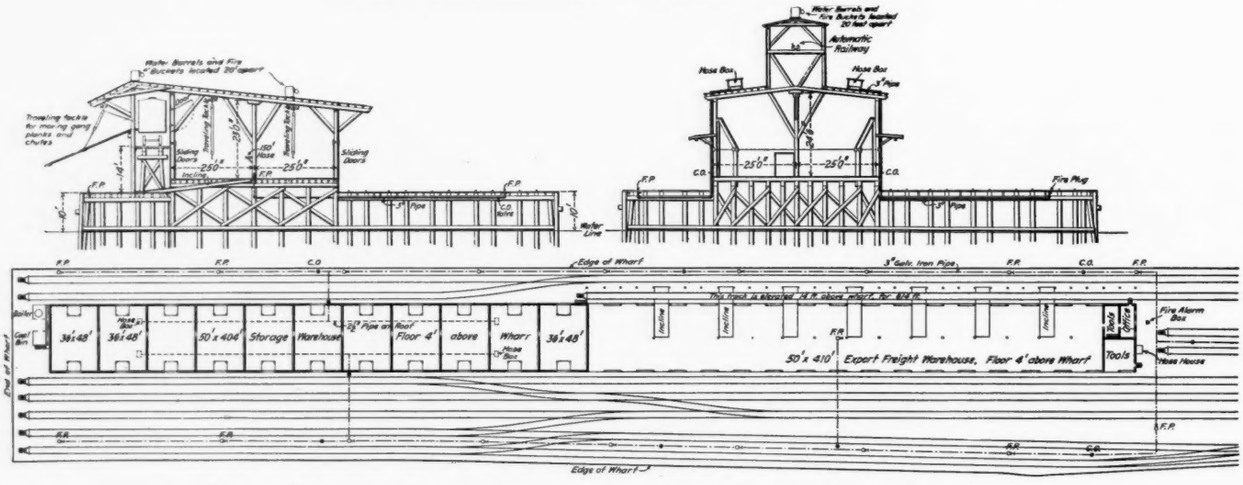
Commandancia and Tarragona Wharfs, Looking North.



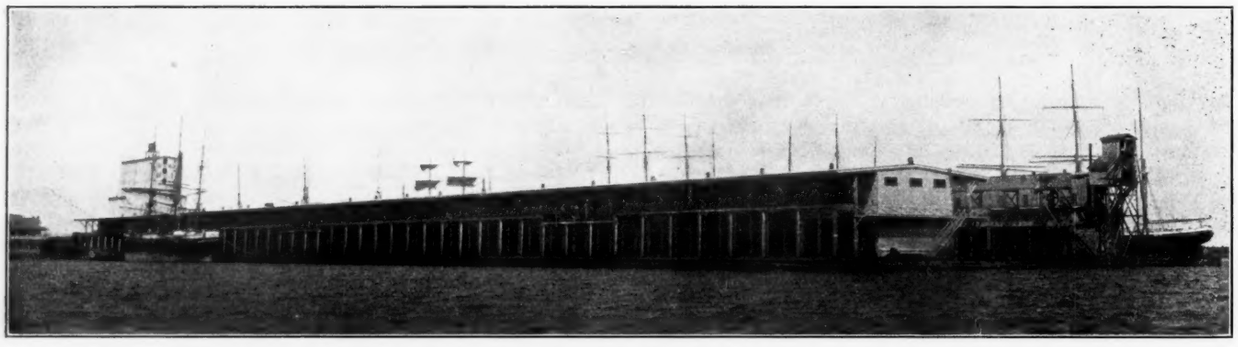
Wharf Office and Grain Elevator.



Plan of Commandancia and Tarragona Street Wharfs.



Plan and Sections Through Export Freight Warehouse and Storage Warehouse.



Commandancia Street Wharf, and Outer End of Tarragona Wharf.

Part of Plant of Atlantic Compress Company.

movement has been in raw materials. It is expected that the port will do a large business in mahogany logs from Central America and Africa, and arrangements have been made to handle a number of steamer loads of this timber. The export business of the city should in future be favored by the fact that Pensacola bay is nearer the Panama canal than is either Mobile or New Orleans, and the city itself is much nearer open water than are the other two cities.

The exports from Pensacola during the calendar year 1907 included the following:

Coal, gross tons	68,713
Cotton, square bales	195,533
Resin, barrels	339,773
Sawn and hewn timber, superficial feet	119,285,544
Lumber, superficial feet	163,024,000
Cottonseed products, tons	4,576
Phosphate rock, tons	95,548
Turpentine, gallons	903,160
Staves, pieces	106,514
Tobacco, pounds	4,865,153
Value of the exports	$19,891,792.00

This tonnage was carried in 88 sailing vessels of 94,466 tons net register, and in 187 steamers of 421,100 tons net register; total vessels, 275; total tons, net register, 515,566. The bulk of the cargo was consigned to ports in Europe and in the United Kingdom, with some for South American, Central American, Cuban and North African points.

The import cargoes, consisting mainly of raw materials, aggregated 87,292 tons, valued at $650,643.

Both the export and import cargoes from and to European countries originated at or had consignment to the territory south of the Ohio river and east of the Mississippi river, principally in Florida, Alabama, Georgia, Mississippi and Tennessee.

The regular steamship service is as follows:

Destination.	Line.	Sailings.
Liverpool, England	Serra Steamship Line.	Bi-monthly.
Bremen, Germany	Teutonic Line.	Bi-monthly.
Antwerp, Belgium	Flemish Line.	Monthly.
Havre, France	Pensacola-Havre Line.	Monthly.
Genoa and Venice, Italy; Trieste, Austria	Austra-Americano Line.	Bi-monthly.

There are, in addition, special sailings to London and Manchester, England; Dunkirk, Nantes, Marseilles and Cette, France; Barcelona, Spain; Leghorn, Italy; Hamburg, Germany, and Rotterdam, Holland.

MR. ARNOLD'S SEVENTH SUBWAY REPORT.

"The Return on the Investment in the New York City Subway" is the title of a seventh report which has been made to the State Public Service Commission by B. J. Arnold. This may be called a summary, or review, of the six other reports dealing with different questions relating to the operation of the subway, which have been noticed in these columns. Mr. Arnold believes that the express stations should have a sufficient number of tracks to accommodate as many trains at one time as may be necessary in order that trains when stopping shall never delay trains behind them; that storage room should be provided at the south end of Manhattan so that cars would not have to be hauled back northward empty in the morning and then again southward in the afternoon; that every car should have a motor so as to afford the utmost facility in increasing or decreasing the length of the trains at any point; that trains should be run short trips wherever possible, so as to avoid the expense of empty car mileage, which is a considerable burden under the present system, where trains are emptied long before they reach the terminus of the road; and that the couplings between cars (and also the air-pipe couplings and the electric couplings) should be so improved that cars can be attached or detached at any station without loss of time. After discussing these and other points, he reaches the following—

CONCLUSIONS.

First—Raise *all* the money for the construction and equipment of such portions of future subways as can be shown to be profitable upon the city's credit and at the lowest possible rate of interest.

Second—For such portions of the system as are clearly unprofitable, let the territory, the value of which is enhanced by the construction of the subways, bear the burden of the initial cost.

Third—Eliminate taxes as is now done with the present subway.

Fourth—Extend the refunding period for the retirement of the cost of subways over as long a period as practicable.

Fifth—Design the express stations of the main stems of such subways upon the reservoir principle so as to secure maximum capacity with minimum investment.

Sixth—Lay out a comprehensive system of transportation and begin the construction of subways at the center of the congested district and extend outward in order to get the benefit of the short haul profits before assuming too much of the long haul burden, and in connection with the short haul business investigate carefully the possibilities of moving platforms for the local tracks.

Seventh—Take advantage of specific cases where railway companies desiring to secure terminals, the indirect value of which to them is great, may be willing to contribute largely to the cost of building portions of a comprehensive subway system.

Eighth—Lease the operating privileges, under proper public supervision, to an operating company upon the basis of an agreed compensation per car-mile—the number of car-miles to be operated, which is the measure of service, to be determined by dividing the income from the traffic by the total cost of operating a car-mile, the income to be sufficient to provide for operating expenses, including maintenance, fixed charges and depreciation, and leave sufficient margin to sufficiently compensate the operating company so as to secure the highest class of skill and efficiency in operation.

Mr. Arnold says that there is a large amount of short-haul passenger business available in the lower part of Manhattan, which is not accommodated either by the surface or the elevated roads. This can be developed by subways so that the business district can be economically extended northward to Fifty-ninth street. This conclusion, however, seems quite evidently to be based on the hope of providing ample local-station facilities; as, for example, with a moving sidewalk. He calls attention to the fact that the money invested in the subway now draws interest varying from 3½ per cent. to 6 per cent., some of it having been borrowed by the city at the lower rate, and some by the operating company (for equipment) at a higher rate. No depreciating reserve fund has been provided by the present management—a fault which should be corrected. For the last fiscal year (ending June 30, 1908) the expenses per car-mile for maintenance of way were 1.8 cents; maintenance of equipment, 1.87 cents; maintenance of power plant, 0.35 cents. Wages of trainmen amounted to 1.79 cents per car-mile, and the cost of power supply was 2.38 cents. Discussing the storage of empty cars, Mr. Arnold says that a subway with two tracks could better afford to provide storage space under Battery Park than to build a single additional track to accommodate the rush southward in the morning and northward in the evening. At present at least one million useless miles are run by cars each year because of lack of storage room, and two millions because trains have to be run through to the end of the line, even when a large share of the passengers have been left at stations near the middle of the line. Mr. Arnold says that coupling and uncoupling cars by hand requires from one to two minutes at each station where cars are taken or left, and this time he would propose to save; but how to save time in testing the air-brakes after the hand operations are finished, he does not explain. He believes that 10 per cent. of the total number of car-miles could be saved, which he estimates would amount to $320,000 a year.

Mr. Arnold estimates that in New York City an ordinary trolley road costs, per mile of track, from $32,000 to $50,000 a mile; a surface road, with underground conduit, from $80,000 to $120,000; an elevated road from $200,000 to $300,000; a subway from $600,000 to $900,000, and a tunnel under water from $1,200,000 to $1,800,000. The foregoing figures do not include electrical conductors, power plants or cars. In general, a subway should not be built unless there is business enough for three elevated lines. Although these estimates are made on a basis of miles of track, they contemplate roads of at least two tracks in all cases, no doubt.

Fully 30 per cent. of the investment in the present subway was for branch lines, which are run at a loss. For such costs as these the property benefited should be assessed.

RECAPITULATION OF POSSIBLE SAVINGS.

Reviewing the entire problem of making a sub-surface sys-

tem of transportation pay a fair return on the investment even with the fare limited to the uniform amount of five cents a passenger, Mr. Arnold gives the following recapitulation. The cost of operating the present subway is shown in column A (year ending June 30, 1908). The extreme theoretical reduction in cost that can reasonably be expected is shown in column B, and in column C, the lowest probable practical limit of cost that can be attained in the operation of future subways under the most favorable conditions. All figures are given in cents per car mile.

Comparative Operating Expenses.

	Cost, cts. per car mile. A.	B.	C.
Maintenance of way. The reduction is due to the possibility of operating more cars than is done at present over each track.	1.18	.18	1.00
Maintenance of equipment. The saving shown may be accomplished by providing the most economical repair shop equipment.	1.87	.27	1.60
Maintenance of power plant. Very little saving is to be expected except that due to running more cars or providing slightly less reserve machinery than has been thought best with the present subway.	.35	.10	.25
Wages of trainmen. The only reduction that can be expected in this item will be due to efficiency in the management of the men and trains, and not in the reduction of the cost of labor. Every car mile operated will require its quota of trainmen.	1.79	.04	1.75
Wages of station men. All station expenses per car mile will become less as the volume of traffic increases.	.84	.34	.50
Other transportation expenses. This item also *diminishes* as the number of car miles increases, although the reduction cannot be expected in the same proportion as the increase in car miles.	.95	.40	.55
Power expenses. Every car moved one mile will require approximately the same amount of power, unless the average speed is reduced. Some slight economy may be expected with increase in load.	2.38	.20	2.18
General expenses. This item will become smaller as the car miles increase, as the total expenses are divided among a larger number of car miles.	.69	.25	.44
Total operating expenses. As the fullest limit of economy cannot be expected with every item in any one case, it is probable that 9 cents per car mile represents the lowest practicable operating cost, in the present state of the art.	10.05	1.78	8.27

*Comparative Fixed Charges—Column A Estimated.**

	Cost, cts. per car mile. A.	B.	C.
Interest on permanent way. This item can be limited by keeping down the investment and by operating the tracks up to their fullest limit of capacity during rush hours.	4	2	2
Sinking fund for permanent way. This item can be reduced in the same proportion as the previous one. The 1 per cent. determined upon as the rate for sinking fund with the present subway is not any too large.	1	0.5	0.5
Interest on equipment. By reducing the rate of interest from 6 to 4 per cent., a considerable saving can be effected. If the policy of providing funds for the equipment by means of the city credit could be followed the saving in interest per car mile would go far toward providing an adequate depreciation reserve for the replacement of this equipment.	3	1	2
Total for fixed charges. It will be seen that the possibilities for saving are nearly twice as great with the fixed charge accounts as with the operating expense items.	8	3.5	4.5
Total cost, including both operating expenses and fixed charges. The sum total of all the possible economies amounts to 5.28 cents per car mile, or 30 per cent. of the total average cost of operating each car mile in a subway similar to the present subway. As the lowest limit can only be secured by strict economy in investment and in operation, which in some cases might reduce the quality of the service supplied, it will be better to assume a medium figure of between 14 and 15 cents per car mile as the low practicable limit which can eventually be expected with future subways. With the present subway it will be difficult to introduce sufficient economies to reduce the total cost per car mile to less than 17.5 cents.	18.05	5.28	12.77

* The first column shows the results that can be obtained by operating 50,000,000 car miles in a subway in which the permanent way cost $50,000,000 and the equipment $25,000,000, which is approximately the ratio with the present subway.

Recapitulation of Estimates for Future Operations.

	Subway similar to present subway. Cost per car mile— Cts.	future subway. Cts.
Income per car mile—		
From passenger operation only	23	18
From advertising, sale of power, etc.	1	1
Total gross income per car mile.	24	19
Operating expenses	10	9
Net earnings	14	10
Fixed charges	7.5	5.5
Surplus to be applied to dividends and depreciation	6.5	4.5
Depreciation at the rate of 3 per cent. per year on actual investment in equipment.	—	1.5
Surplus for profit.	6.5	3

From the foregoing analysis it will be seen that in order to pay a profit of 6.5 cents per car mile from the operation of a subway similar to the present subway, *it is necessary to crowd the passengers in the cars* so that the average income *from passenger revenue* amounts to 23 cents per car mile. Furthermore, in order to maintain this profit of 6.5 cents per car mile, which in the case of the present subway is now all disbursed as dividends, the item of depreciation on the equipment must be entirely neglected.

The second column shows that if changes are made in the methods of financing, constructing and operating subways it is possible to design and build future subways that will furnish adequate service for a five-cent fare and at the same time take care of depreciation and interest on the investment. That the service can be adequate is indicated by the fact that the *income per car mile from passenger revenue only* need not be more than 18 cents, instead of 23 cents as required under present conditions.

In order to produce this result the following economies must be secured:

	Saving per car mile. Cts.
1. Reduce the investment required for permanent way by raising by special assessment on the property benefited the first cost of all branch lines. The saving per car mile would approximate	1
2. Increase the earning capacity of each dollar invested in permanent way by designing the stations on the main line on the reservoir principle, so that 60 trains an hour can run over each main line track. Practicable saving per car mile.	1
3. Effect economies in operation and maintenance and reduce relative importance of general expenses by operating more cars with same organization charges. Saving per car mile.	1
4. Raise the money for the first cost of the equipment on a basis of 4 per cent. instead of 6 per cent., either by using the city's credit or otherwise. Saving per car mile.	1
5. If all the investment for both the permanent way and the equipment could be secured solely upon the city's credit, the "profit" made by the operators over and above interest charges could be justly reduced, as the operators would then assume no financial risk. With the present subway, which pays nominal taxes amounting to about $60,000 per year, about 1¼ cents of every 5-cent fare goes toward "profit." If the city furnished the money for the equipment as well as for the permanent way, then this profit could be reduced from the present rate of about 6.5 cents per car mile to not more than 3 cents. At this rate the profit to the operators would amount to $1,500,000 per year on the basis of 50,000,000 car miles. Thus the saving per car mile to the subway system by this arrangement would amount to at least	3.5

The sum of all these savings amounts to 7.5 cents per car mile, but as it may not be practicable to secure the full measure of economy indicated as possible in each case, the total saving may be taken as 6.5 cents per car mile.

It is feasible to construct, operate and maintain subways in certain localities within the congested districts of New York and operate them upon a five-cent fare, but * * * these short-haul subways cannot be divorced from the long-haul feature and consequently with the return upon the investment now required by private capital there is now no field in New York City for the construction of a comprehensive system of subways entirely with private capital unless the fare for the long-haul passenger is something more than the present five-cent fare.

The working expenses of the Prussian State Railways, which in 1896 were 54 per cent. of the gross earnings, in 1908 were about 72 per cent. Better service, and especially higher wages and higher prices of supplies, have done it.

CHAMBER OF COMMERCE ON NEW YORK RAPID TRANSIT.

A committee of the New York Chamber of Commerce, appointed Nov. 4 has reported on the rapid transit problems of New York City. The committee consisting of E. H. Outerbridge, chairman; Paul M. Warburg, Howard C. Smith, Clarence H. Kelsey and J. Edgar Leaycraft, declares itself strongly inclined to private construction, equipment, and operation of subways hereafter to be built, and advocates legislation granting more favorable conditions to private capital. The municipal construction of further subways is out of the question, as the city has not the borrowing power to undertake such projects. Subways should be built, equipped and operated by private capial, with the option to the city to purchase, operation to be conducted upon specific terms of profit-sharing with the city in lieu of taxes or payment for franchise rights. This principle has accomplished the settlement of the aggravated conditions formerly existing between the surface railways in the City of Chicago and the city. Under the agreements arrived at, the corporations have been enabled to obtain large amounts of new capital for reconstruction and extension, and the city has received in the first year of operation about $1,600,000 as its share of the profits without having incurred any obligations. The committee believes that it may be found necessary, in view of the cost of long-haul traffic in the present Subway, to increase the rate of fare on the express trains, while leaving the local fares at 5 cents. Thus persons who could use the slow trains would have the choice of the cheaper rate. A ten-cent fare would mean an additional expense of $31 per annum, but this would be offset by the savings in rent in suburban districts and by healthy living conditions.

* * * At present the financial problem is beset with so many uncertainties that private capital cannot look upon the undertaking as safe. The community can dictate the operation and the routes, service, and fare may not be settled by considerations of financial return, but by the question of what may be best for the city at large; therefore, the city should make good any deficiency in operating. Where capital has to subordinate its own interest to that of the public to such an extent that on the legitimate share capital not even 3 or 4 per cent. could be earned, the community at large certainly would have received so much in service that no reasonable objection could be raised to making good the deficiency out of the annual tax budget. * * * Structures built by private capital would become the property of the city for a nominal consideration. * * * If private capital is to be attracted, it will be necessary to make legal provisions by which the security of the investment and a stated degree of return thereon cannot be jeopardized by changes to be made on the simple order of any commissioners who may then happen to be in office.

To this end the committee advocates a board of arbitration consisting of three engineers, one chosen by the city, one by the companies, and the third by these two, which shall pass upon the reasonableness of orders of the Public Service Commission before they are promulgated.

The proposal to have the cost of subway construction assessed on the abutting property owners might be useful in outlying districts, if the assessment bonds could be issued, so that they cannot become a lien on the general credit of the city.

As a matter of immediate relief the committee favors the extension of the present Subway south from Forty-second street on the west side and north from Forty-second street on the east side, and favors the construction of a third track on the Second and Third avenue elevated roads. The Steinway Tunnel either ought to be acquired by the city "on favorable terms," or else a franchise should be granted to allow its being put into operation.

The Elsberg law is criticized. It has been as obstructive "as though it had been designed for the purpose of preventing construction of rapid transit lines." As the laws now stand, additional subway lines if built by the city would have to be operated by it; for contractors could not be found to lease them.

The report indorses the Public Service Commission law, declaring it has made impossible many abuses, but "the extent to which regulation should go is a debatable question. The Public Service Commission can practically assume the usual prerogatives of operating officials, and can issue orders for operation and equipment after preliminary hearings, which, if enforced, can only be contested in the courts on the ground of confiscation. The law does not specify that the commissioners shall be experts in this field, nor do they incur any financial responsibility by reason of their acts and orders. They are under continuous pressure from associations of citizens and the public generally, and, presumably, cannot altogether escape from political influences."

" * * * Great deal of deliberation, education, and negotiation will be necessary to work out a wise solution. * * *"

MISSOURI RATE LAW UNCONSTITUTIONAL.

A decision in favor of the railways was handed down on March 8 by Judge McPherson of the United States District Court in the two-cent fare and maximum freight rate cases, involving 18 Missouri lines. The railways contended that the rates fixed by the statutes of the state were not remunerative, but confiscatory, and asked that the enforcement of the statutes be enjoined. The state brought proceedings to have them enforced.

The maximum freight law involved reductions ranging from 2 per cent. to 40 per cent. on freight in carload lots. The railways secured a court order temporarily restraining the state officials from putting this act into effect, and on June 11, 1907, Frank Hagerman, representing the various railways, petitioned the court to make this order permanent. By mutual agreement and at the suggestion of Judge McPherson, who desired to have a practical test, the two-cent passenger rate law was put into effect on June 11, 1907, to run three months. At the end of that period both sides agreed to continue the rate in effect, as the results obtained had not been considered sufficient and the law is still being enforced.

After many delays, the cases were finally brought to trial before Judge McPherson. The final arguments were presented on January 20 last. At that time Governor Hadley, who, as attorney-general, had begun the cases, spoke for the state. Mr. Hagerman made the principal argument for the railways.

"The question," said Judge McPherson in his decision, "is whether the traffic wholly within the state of Missouri generally referred to in the evidence as local traffic, can be carried under the freight-rate statute of 1907, and the passenger-fare statute of 1907, at such profit as will give a reasonable return after paying expenses upon the investment, or whether such traffic is carried at a loss, or less than such reasonable profit. * * * The court has reached the conclusion that upon this question the statutory rates fixed by either and both statutes are not remunerative."

In giving the reasons for such conclusions, the decision says:

"The unquestioned and undoubted rule is that there is a presumption both of fact and of law in favor of the validity of every legislative enactment. The railway companies have the burden of removing this presumption and showing clearly, or, as some experts say, palpably, and others say, beyond a reasonable doubt, that the statute is invalid. In these cases the court has recognized this rule. The authorities on this question form a long and unbroken line, with the single exception of the majority opinion in the Pennsylvania case decided a year ago. (68 Atl. Rep., 676). And that one authority is not persuasive.

"All testimony and argument bearing upon the question as to what consideration the legislature of Missouri gave to these enactments is utterly immaterial. Much was said in argument as to the message of Governor Hughes of New York, two years ago, in declining to approve the two-cent fare statute of that state. Governor Hughes had the moral courage to veto a measure of popular favor because, as he believed, the question had not been fully considered. But the relations of a governor to proposed legislation and those of a court to legislation consummated are entirely different.

"Most laymen and many lawyers believe that the question is whether the railway company as a system is earning sufficient revenue on the value of the property of the system. They believe that if the Burlington, Santa Fe, Wabash, or any other railway system is earning such money as will pay all charges and expenses, including taxes and interest, with reasonable dividends to the stockholders, state rates for state business must stand. Of course, no one believes this who has given the slightest attention to the question. That precise question was decided by Justice Brewer, and affirmed by the supreme court in the Nebraska case of Smyth vs. Ames. The only question is as to Missouri rates, less expenses properly charged against the same. And if this balance does not leave sufficient to pay a reasonable return, the law is invalid. And if the railway system of any company is earning more than a reasonable return by reason of interstate rates, which affect the people many times more than local rates, and if such interstate rates are too high, Congress, either acting alone or through a commission, must make the corrections.

"The Supreme Court, during the present year, in the case of the City of New York v. Consolidated Gas Company of New York, decided that 6 per cent. was fair and right to be given to the owners on the true valuation. My opinion is, that while a gas plant is in some respects different from a railway, that a railway property, properly built and properly managed, should, over and above expenses, make a return of 6 per cent. per annum. And considering all the evidence, it is fairly shown that all of these roads were properly and economically built and are being properly and economically managed, and that, after paying the expenses for maintenance and operation, there is less than 6 per cent. returns, and not more than 3 per cent. on any of them, and as to some of them a deficit, taking the property as above stated within the state of Missouri at its fair valuation. And this is so without reference to bonds, because in no case do these bonds bear 6 per cent. interest. But taking the bonds into consideration, there is still not to exceed 3 per cent. returns, and in many cases a deficit after considering all debits and credits, on the true valuation for the state business. There is no evidence that any of the existing bonds were improperly issued, either as to amounts or rates of interest. In fixing the value the court has considered the evidence of witnesses as to the stocks and bonds outstanding, and the state board for taxing purposes has valued these properties. Of course, those findings are not binding nor conclusive, but they are persuasive.

"The valuation of the roads has been fixed by the court as shown by the findings of fact. The entire state and interstate earnings of each of the roads within the state are known and fixed to a certainty. The expenses are known and fixed. To apportion these expenses must be done according to one of the two theories, and the correct theory is that according to revenue. One theory or other must be applied to both freight and passenger expenses, and the court should not adopt the one theory as to part, and the other theory as to another. The one theory is helpful to the one side, and the other theory helpful to the other side—the one theory to the one side in freight, and the other theory to the other side in passenger. But an arbitrary splitting of theories is illogical and unfair and cannot be recognized. The court has adopted the revenue theory because a great number of the best railway experts of the country, against a very limited number to the contrary, have so testified. Every court that has ever had this question before it in so far as I am advised by the briefs of counsel and my own independent investigation has so held. * * *

"The passenger earnings under the two-cent fare law of 1907, allowing nothing for extra cost over interstate business, give no return whatever to the Rock Island, St. Louis and Hannibal, Kansas City, Clinton and Springfield, and the Great Western. The other companies will have the following: The St. Louis & San Francisco, between 3 and 4 per cent.; the Santa Fe, between 4 and 5 per cent.; the Kansas City Southern, a small fraction over 2 per cent.; the Missouri, Kansas & Texas, between 2 and 3 per cent.; the Burlington, between 3 and 4 per cent. But all this is arrived at by allowing no extra cost of service. But if there be added the extra cost for freight and passenger, there are no earnings over expenses. This is confiscation under the constitution.

"It being a legislative act, and not a judicial one, this court cannot fix rates. If it could, 2½-cent passenger rates would be fixed for the stronger roads, and three for the others. But that is for the legislature, acting itself with experts such as the state employed in these cases, or through a commission with like assistance.

"When the statutes in question were enacted, it was believed by many that by reducing the fare there would be much more travel. For a month or so this proved to be true. But with the novelty gone, the testimony shows that the increase has been less than 3 per cent. and more nearly 1 per cent."

The judge says, as to the abolition of passes, that the evidence shows the passenger revenue is increased by reason thereof less than 1 per cent.

Frank Hagerman, representing the railways, made the following statement:

"The maximum freight laws have never been enforced because the temporary injunctions were granted when they became effective. Therefore the situation as to them will in the future be the same as it has been in the past. The two-cent fare law, howver, has been enforced. From the decision of the court, the state may appeal to the Supreme Court of the United States. Pending that appeal, the railways will not be bound by the law, and may at any time adopt and put in force the old rate by publishing new schedules as required by law. The state law requires 10 days' notice of an advance in the state rate; the interstate commerce law requires 30 days' notice of any change in the interstate rate. What rate the railway will adopt and when it will be put in force, must, of course, be determined by the traffic officials after they have carefully considered the text of the decision.

"The two-cent rate is the subject of pending litigation in Minnesota, South Dakota, Nebraska and Kansas. It is not conceivable that, if the rate is confiscatory in Missouri, it can be compensatory in any of such states. What, if anything, will be done in other states has not been determined. In view of the thorough investigations and the decisions in the Pennsylvania and the Missouri cases, it is doubtful whether any state will longer attempt to keep in force a two-cent fare law. Oklahoma makes provision therefor in its constitution, which may be difficult to change.

"Judge McPherson proceeded with unusual care and caution, and at great personal sacrifice to himself heard the testimony orally. He has laid down in simple words certain rules, by the use of which any legislature seeking to pass a rate law, or any railway desiring to contest one, can readily determine whither it is confiscatory: These rules are: Ascertain the value of the entire railway property in the state; of such value, assign to the traffic to which the rate in question applies such proportion as the revenue from such traffic bears to the entire state revenue; on this assignable value there must be an annual return of a least 6 per cent. Expenses as between state and interstate business must be divided on a revenue basis, and have added thereto the extra cost of doing state business over interstate business."

Governor Hadley is quoted as saying that the decision does not end the fight. While the decision is simply the opinion of one judge, it must be accepted as the law until the case is submitted to the Supreme Court of the United States. That he thinks the decision is wrong, goes without saying. The theory of the railway experts, that the expenses common to state and interstate traffic should be divided in proportion to the revenue produced by the two classes of traffic with an added increase of cost for doing state business, seems to him manifestly absurd, and its logical result would be that the higher the rates and the greater the revenue produced by the state traffic, the larger would be the amount of expenses assigned to that traffic.

ELECTRIFICATION OF MELBOURNE SUBURBAN LINES.*

BY CHARLES H. MERZ, M.INST.C.E.

XVII.

One of the tables gives for the different stages of the work a summary of the previous estimates of capital expeditures necessary for the introduction of electric traction.

Summary of Capital Expenditure Involved by Electric Traction and Resultant Increased Interest Charges.

	Port Melbourne and St. Kilda branches.	Stages I.	Stages II.	Stages III.
1. Power station, high-tension feeders and sub-stations*	£221,333	£386,357	£580,430	£846,689
2. Track equipment.†	53,330	170,328	311,035	568,139
3. New rolling stock.‡	67,674	221,657	426,044	754,881
4. Inspection pits and Flinders St. car-sheds.	14,392	23,538	45,179	57,341
5. Total cost, electric scheme	£356,729	£801,880	£1,362,688	£2,227,050
6. Less expenditures to deal with traffic by stm. trac.	41,730	149,945	274,696	425,590
7. Net adtl cost, electric scheme.	£314,999	£651,935	£1,087,992	£1,801,460
8. Interest at 4 per cent per an.	12,600	26,077	43,520	72,058

*Including spares for power department.
†Including low-tension cables and alterations to permanent way, and spares.
‡(Less credits), alterations to existing stock, and electrical equipments, including spares.

The operating expenses with electric traction are comparable with the operating expenses with steam traction. The table giving the former shows that although a much more frequent service and a greater schedule speed would be given with electric traction than with steam traction, the operating expenses

Operating Expenses with Electric Traction.

	Port Melbourne and St. Kilda branches.	Stages I.	Stages II.	Stages III.
Power Department:				
Cost of power	£7,719	£24,809	£46,267	£70,591
Rolling Stock Department:				
Motormen's wages and stores.	2,693	10,052	19,027	29,079
Inspection and maintenance of rolling stock & equipment	4,692	25,714	49,570	76,911
Transportation Department:				
Additional staff at stations	510	1,968	3,640	6,840
Guards' wages and stores	2,229	7,728	15,158	23,479
Way and Works Department:				
Maint. of elec. track equip.	720	3,300	6,700	12,800
Electric traction—				
Operating costs—total.*	£18.563	£73,571	£140.362	£219,700
Do. per train-mile	13.34*d.*	12.10*d.*	11.52*d.*	11.03*d.*
Steam traction—				
Operating costs—total*	23,100	85,877	160,097	246,967
Do., per train-mile.†	19.38*d.*	19.06*d.*	18.98*d.*	18.93*d.*
Difference in favor of electric traction—total	£4,537	£12,306	£19,735	£27,267
Do., per train-mile	6.04*d.*	6.96*d.*	7.46*d.*	7.90*d.*

*See second note in table of operating expenses with steam traction.
†Train-miles 12 per cent. increase on 1906 returns.

of the former would be slightly lower. If the two systems be compared on the basis of the operating expenses per train-mile, electric traction shows up still more favorably, steam traction costing from 45 per cent. to 72 per cent. more according to the stage taken.

A comparison between the cost of steam and of electric traction if interest on the capital cost of the electrification scheme be taken at 4 per cent. per annum and debited to the cost of electric traction is given in one of the tables. This table also compares these results, for each stage, with the increase in revenue resulting from the improved facilities for travel rendered practicable by electric traction. If the comparison as to financial results from steam and electric traction be based solely on the figures shown in this table, a slightly larger increase in traffic than the 5 per cent. suggested is

Comparison of Increased Cost of Electric Service with Increased Revenue Due to Improved Facilities.

	Port Melbourne and St. Kilda branches.	Stages I.	Stages II.	Stages III.
1. Interest charges, 4 per cent., on capital cost elec. scheme	£12,600	£26,077	£43,520	£72,058
2. Saving in operating expenses with electric traction	4,537	12,306	19,735	27,267
3. Extra cost of electric traction including interest charges	£8,063	£13,771	£23,785	£44.791
4. Additional increase in revenue on basis of 5 per cent. greater traffic with elec. traction	2,500	11,073	20,520	28,632
5.* Do., on basis of 10 per cent. greater traffic	5,000	22,145	41,040	57,265
6.* Do., on basis of 15 per cent. greater traffic	7,500	33,218	61,560	85,897
7. Actual percentage increase.†	16.1%	6.2%	5.8%	7.8%

*The estimates assume a difference of 5 per cent. only in additional revenue, but for convenience corresponding figures are also given for increases of 10 per cent. and 15 per cent.
†Of revenue above the assumed normal growth of 20 per cent. necessary for the revenue at the different stages to balance the additional capital charges, less the saving in operating expenses.

necessary to justify the substitution of electric traction for steam. It will be seen, however, that the amount required in order to restore the financial balance in favor of electricity is comparatively small at all stages except that for the Port Melbourne and St. Kilda branches.

The factors affecting the growth of a large system like this are so numerous as to make it impossible to speak positively as to the increase in traffic following on the introduction of electric traction, but after a very careful comparison of your conditions with those of other suburban systems before and after their conversion to electrical working, I am of the opinion that 10 per cent. is a conservative estimate of the additional revenue which will result within a comparatively short time from the improved service proposed.

I have now compared the results obtainable by electrical working with those to be expected if steam working be continued. Another, and somewhat different, way of looking at the matter is to take electric traction by itself and consider whether, in view of its many advantages, the fact that it can be installed and worked so as to yield a steadily increasing profit justifies its adoption. The final table compares the estimated profits from the suburban railways in 1912 with electrical operation (assuming the normal increase of traffic—20 per cent.—plus the minimum of 5 per cent. due to improved service—with the actual profits for the year 1906 with steam traction.

Profit from Suburban Business in 1906 (*Steam*) *and* 1912 (*Electric*).

	Port Melbourne and St. Kilda branches.	Stages I.	Stages II.	Stages III.
Operating expenses, 1912, electric.	£18,563	£73,571	£140,362	£219,700
Operating expenses, 1906, steam.	19,273	71,641	133,468	205,871
Increase, operating expenses	£710*	£1,930	£6,894	£13,829
Increase in revenue	12,500	55,363	102,600	143,162
Increase in gross profit	£13,210	£53,433	£95,706	£129,333

*Decrease.

It will be seen that if the Port Melbourne and St. Kilda lines only are proceeded with there will hardly be sufficient profit to pay the interest charges on the new capital expenditure. This arises largely because, in this case, the amount

*Abstract from the Report to the Victorian Railways Commissioners on the application of Electric Traction to the Melbourne Suburban Railway System. Published by the courtesy of the commissioners.

of electrical energy required is really not sufficient to bring the cost of generation down to a reasonably low figure. But if in addition to the Port Melbourne and St. Kilda lines we include the Brighton and Essendon lines, Stage I., the scheme becomes one of sufficient size to secure real economy of generation, and the financial results from the suburban system in the year 1912 would be considerably better than they were for the year 1906*; the additional surplus is, in fact, £21,358 after paying interest on the new capital expenditure. For the complete scheme this figure rises to £40,251.

SUMMARY OF CONCLUSIONS.

The report deals with two main questions:—

I. Is the substitution of electric traction for steam traction on the Melbourne Suburban system financially justified?

II.—If so, how can electric working be best applied?

After referring to the special importance of the suburban business, the experience of other cities and the advantages offered by electric traction, both to the public and to the management, technical considerations are dealt with and financial results determined.

The main conclusion is that on account of the great advantages to the public and the improvement in financial results to be expected from so doing, the application of electrical operation to the suburban railways is justifiable.

The more important conclusions and recommendations are here given in order of convenience rather than in their actual sequence in the report itself.

Capital Outlay.

(1). The total capital outlay for the conversion of the whole suburban system will be £2,227,050. It is recommended that a portion only of the system be converted at present (see No. 19, below).

(2). In considering these figures the expenditure necessary if steam traction be retained must also be taken into account. This expenditure on rolling stock only amounts to £408,358.

Cost of Electric Working.

(3). The expenses per train-mile with electric traction would be 11.0d. as against 18.9d. with steam. With the former, however, there would be a greater train-mileage.

(4). The total operating expenses with electric traction for the whole suburban service would be £27,267 per annum less than with steam (see No. 9).

Financial Result.

(5). The total annual expenditure for the whole service, including 4 per cent. on the new capital outlay, would be £44,791 more than with steam; against this must be put the additional revenue due to the improved service.

(6). The surplus, after paying interest on new capital for the complete scheme, would with electric traction be £40,251 greater than was obtained in 1906 with steam.

Improved Service.

(7). If electric traction be adopted, an improved schedule speed and frequency of service becomes possible with the existing tracks and termini.

(8). An increase of 20 per cent. over the present schedule speed and an increase of 71 per cent. in the train-mileage, are financially justifiable, and are covered by the expenses referred to above.

Rolling Stock.

(9). The adoption, instead of locomotives, of the "multiple-unit" system of train operation is recommended, giving this increase of 71 per cent. in the train-mileage with an increase of only 23 per cent. in the ton mileage.

(10). Cross-compartment coaches should be adopted, the existing bogie stock being altered and used for the electric service.

(11). The total stock required would be 496 coaches with electric working, as compared with 546 coaches and 110 locomotives with steam, the reduction in the number of coaches being due to the higher schedule speed.

Electrical System.

(12). A direct-current 800-volt system would be the cheapest and best system for this particular case.

(13). The direct current should be distributed to the trains from sub-stations by means of a protected conductor rail.

(14). The sub-stations should be supplied with three-phase high-tension current from the power station by means of underground cables in the central areas, and by overhead lines in the less populous districts.

Power Station.

(15). The energy required should be generated in a central power station situated at Yarraville, designed to handle the load of 35,000 electrical horse-power.

(16). This power station should be designed to burn either black or brown coal, and the power plant should consist of water-tube boilers and steam turbines.

(17). The Spencer street and Elsternwick stations should be shut down, and the St. Kilda Tramway and the existing lighting system supplied in bulk from Yarraville.

(18). The Yarraville power station should be also used for the lighting of the railway stations and the driving of the Newport and North Melbourne workshops.

Initial Scheme.

(19). If electric traction be decided on, the scheme proceeded with in the first instance should consist of the Port Melbourne and St. Kilda and the Brighton and Essendon Branches, involving, with power plant, an initial expenditure of £801,880.

(20). After paying interest on this sum the surplus from these lines would, with electric traction, be £21,358 greater than was obtained in 1906 with steam traction.

(21). If steam be retained on these lines, £141,019 will have to be spent on rolling stock for them alone.

(22). The conversion of these lines should be so arranged that the electric zone might be extended to the other suburban lines at a future date with a minimum of alteration and expense.

Other Operating Changes.

(23). Such questions as systems of train despatching, automatic signaling, new block sections, special provisions for race traffic, etc., would be best deferred until part, at least, of the system is being worked electrically.

*The estimated operating costs in the final table assume at all stages that the power and lighting scheme would be proceeded with and that the amount of electrical energy required for this purpose would reduce the cost of power to the traction scheme. If this allowance were not made, the financial result of converting the Port Melbourne and St. Kilda branches only would be even worse, as at this stage the effect on our estimated operating costs of the power and lighting scheme is considerable, owing to the relatively large amount of electrical energy it would require.

GERMAN FREIGHT CAR UNIONS.

Stringent requirements have been in effect in Germany requiring the return home of borrowed equipment, and a tariff for the rental of cars when conveying freight over lines other than those belonging to the state, is rigidly enforced. Practically the same rules control the movements of freight cars between the different German states as between various European countries. The system involves an enormous amount of bookkeeping and adds to the work of stationmen. During 1907 $4,600,000 was paid between German railway lines for car hire, and the transport of empty freight cars to home territory exceeded 125 million car miles.

To do away with the loss and expense involved in existing conditions, the directors of the various state railways have organized a general freight car union. The head office of this organization will be at Berlin, and it will be responsible for over 500,000 freight cars. Territorial lines will be abolished in the scheme of organization, and the railway network of the empire will be divided up into natural districts, each of which will be assigned its quota of cars. The distribution within a district will be controlled by the local traffic manager. To meet the varying demands of individual sections according to the season of the year, or in response to unusual local industrial conditions, the effective distribution of rolling stock between districts will be directed from the Berlin office. Repairs to cars will be made at once in whatever district they may be found necessary. Future additions to the stock of cars will be made from funds supplied by the constituent members of the Union, and standard types will be adopted.

There will be a single annual adjustment of accounts by the constituent lines to balance up the inequalities between cars furnished and cars used by each line. This item of accounting will be of the simplest character, being based upon the year's traffic returns, and will involve only a few day's work by an expert. Arrangements are being made to bring the new plan into operation on April 1, 1909.

The French railway in Abyssinia from the coast by way of Harrar to Adis Abeba, the seat of government, which has had more than one struggle to get itself built, is reported to be in danger again on account of the competition of camels. Trains of loaded camels come up from the coast, while the railway trains are nearly empty. The camel traffic is in the hands of men who own nothing but camels, and who cut rates till they get the freight. The camel drivers are said to make disrespectful gestures to the trainmen as they pass with an empty train.

General News Section.

The amount of creosote imported into New York during the past year is estimated at 25,000,000 gallons. In 1904 only 3,500,000 gallons were imported.

At the meeting on March 12 the Central Railway Club's committee on the revision of Master Car Builders' Rules of Interchange will submit its report.

The Brotherhood of Locomotive Engineers is to put up a large office building at Cleveland. The building will require 2,400 tons of steel, and the King Bridge Co. has the contract.

The Commercial Cable Co. is to cut one of its cables 300 miles east of Newfoundland and divide it at St. Johns. By thus making two sections of the cable the speed of transmission can be increased 35 per cent.

The Boston & Maine is to install telephones for train despatching between Boston and Fitchburg, 50 miles. A metallic circuit will be put up, to be composed of copper wire weighing 210 lbs. to the mile, and Gill selectors will be used for calling.

During the year 1908 the Pennsylvania Railroad kept special records of 369,315 trains, and it was found that 88 per cent. of them came into their terminals on time. The through trains included in these figures averaged 87 per cent. on time, and one-quarter of these trains which came in on time had been detained on the road and had made up a part of the time that had been lost. During the 12 months of 1908 the 18-hour train arrived in Chicago on time 315 days, and in New York 314 days.

In the United States District Court at Lynchburg, Va., March 9, a plea of guilty was entered by counsel for A. A. Luck, E. T. Edmunds, Samuel Butler, Robert Branthan and Walter Wildman, sub-contractors on the Virginian Railway, in April, 1907, to the charge of holding laborers in peonage. Luck was fined $1,000, Branthan $500, Edmunds $150 and the others $100 each. These contractors through labor agents got a number of Italians to work on the railway. Many of the laborers desired from time to time to leave the work, but were prevented by the gang bosses, who used threats, and in some instances did actual violence to the men.

The annual report of the Pennsylvania Railroad Voluntary Relief department for the last calendar year closes 23 years of successful operation, during which time the total payments for benefits and expenses have been a little over 22 million dollars. The railway companies—the Pennsylvania and its three principal subsidiaries east of Pittsburgh—have paid nearly one-fourth of this sum, having borne all of the operating expenses and having paid over a million dollars for relief to sick members who had exhausted their title to benefits and for deficiencies in the treasury in the years when the assessments did not equal the payments. The membership at the end of 1908 was 91,777, which is about 8,000 less than at the beginning of the year. Over 25,000 new members joined, but there were 32,000 who left the service of the company. The death rate during the last year was equal to 9.7 per thousand members, and the average number of members constantly disabled was equal to 41 per thousand.

General Manager Atterbury, of the Pennsylvania, has sent a telegram to General Superintendent Brooks, of the Philadelphia, Baltimore & Washington, and to General Superintendent Myers, of the Northern Central, congratulating them on the success with which they coped with the unusual snow and sleet storm of March 3. He says:

"With the very extraordinary conditions existing, and in the absence of any means of communication to direct the very heavy passenger train movement in connection with the inauguration, it is very gratifying to know that the same was accomplished without accident or loss of life, and I wish to extend to your trainmen and all others concerned my appreciation of the care and good judgment exercised by them in this emergency." In the height of the extra travel to the inauguration of President Taft a severe storm of snow, rain and wind destroyed the telegraph lines between Philadelphia and Washington for 30 miles or more, and many of the poles fell across the tracks.

Brakemen Not to Go on Car Roofs.

The New York State Public Service Commission, Second district, has issued to-day an order directing the New York Central to put into effect on March 30 rules forbidding any employee going on the top of moving trains or locomotive tenders, freight or passenger, on any portion of its lines within the electric zone (New York to Croton and to North White Plains), or in making up trains, switching or other train movement at or about any station yard or siding within the electric zone when such movement passes under or within 300 ft. of any bridge or other overhead construction having a clearance above the track of less than 21 ft.

Fifteen Billion Tons of Traffic "In Sight."

A press despatch from Salt Lake City, March 3, announcing the running of the first passenger train over the Western Pacific from Salt Lake City to Wendover and back, incidentally reminds a waiting world that for some miles the new road runs over a bed of salt, which contains 483,000,000 carloads of that substance. With so much freight which is absolutely sure to go out by this line the selling of stock in the road ought to be as easy as selling tickets in the New York subway. To properly mystify the public the prospectus should call attention to the fact that these salt beds will provide an average of exactly ten tons for each inhabitant of the earth. Estimating 3 lbs. as the average annual consumption of salt by each human being, and making proper allowance for the slack demand in countries like India where salt is not so freely eaten, we thus see that the Western Pacific is sure of a good income for seven thousand years.

Mr. Wilgus' Rapid Transit Proposal.

Application was made this week to the New York State Public Service Commission for a franchise for an "inter-terminal belt line" in New York City, entirely within the Borough of Manhattan, a modification of a more extensive system of freight subways submitted to the Commission some months since by W. J. Wilgus, formerly vice-president of the New York Central and now president of the Amsterdam Corporation, of 165 Broadway (*Railroad Age Gazette*, October 16, 1908). In the present enterprise Mr. Wilgus gives as his associates Gustav H. Schwab, C. D. Halsey & Co., J. G. White & Co., P. A. S. Franklin, Hodenpyl, Walbridge & Co. and C. C. Cuyler.

The proposed system consists of a four-track water front belt line, elevated in some places and underground in others, with a crosstown line at 59th street and lines connecting with the Grand Central and Pennsylvania passenger terminals. Mr. Wilgus states that he is aware the franchise cannot be granted until certain changes are made in the rapid transit laws.

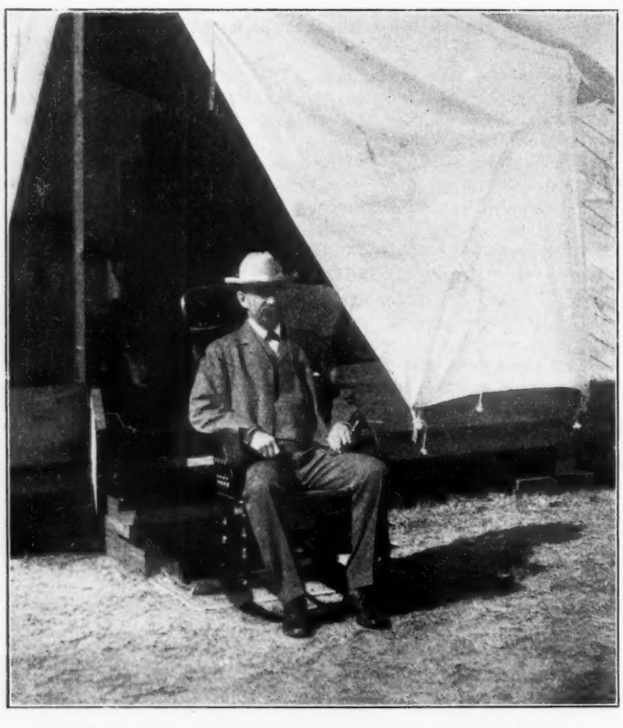
It is proposed to carry passengers at 5 cents each and the builders would not ask the city for either money or credit. In his application Mr. Wilgus said:

"The need for rapid transit along the water front, where an elevated structure would be unobjectionable; the benefit that the public would reap from some convenient means of interchange between the termini of the great trunk line railways and steamship lines; the relief that would follow a through train service from the suburban regions on the north to the Battery; the partial solution of the West Side freight problem; the stimulating effect upon the city's growth of opening the great East Side district to commercial development; and, above all, the prompt relief that would be afforded to the entire transit situation in Manhattan—all these are reasons

why the plan for an interterminal belt line for passengers appears to have merit, from the standpoint of the investor, the municipality and the general public."

With a view to preparing an amendment to the existing rapid transit acts which would allow of the building of such a system as Mr. Wilgus asks for, the Public Service Commission will hold public hearings and order conferences between the engineers of the board and the engineers of the Amsterdam Corporation.

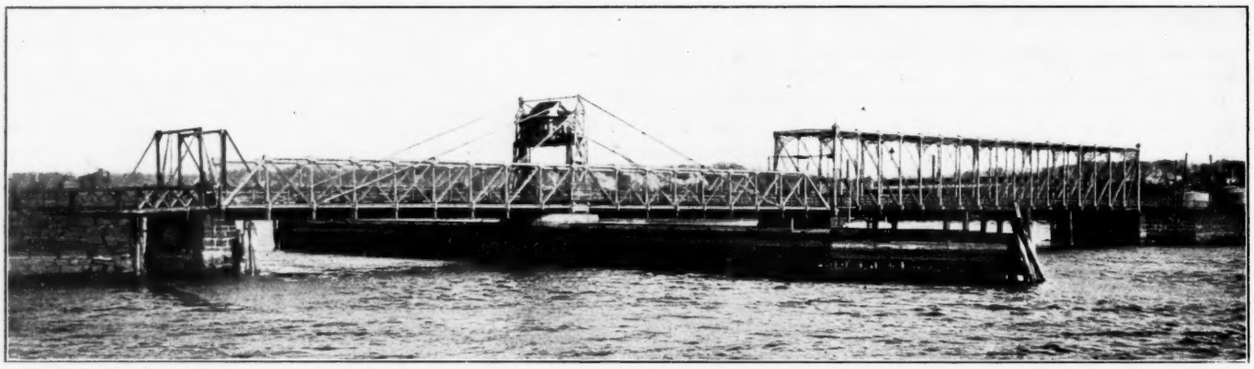
At a hearing before the Public Service Commission in New York this week to consider the application of the Hudson-Manhattan Tunnel Company for permission to extend its Sixth avenue tunnel to the Grand Central Station T. P. Shonts said that the Interborough company was prepared to build elaborate extensions of the present subway with its own money to the extent of $49,000,000, demanding of the city only $1,000,000, this municipal contribution being technically obligatory, it is understood, under the present laws governing subway building. Mr. Shonts proposes the extension of the present subway from 44th street southward under Seventh avenue and Greenwich street to the Battery, and northerly from the Grand Central Station under Lexington avenue to the Harlem river. This would give two trunk lines, one on each side of the city.



E. H. Harriman Outside His Tent at San Antonio.

A Railway Bridge with a History.

The accompanying illustration shows two sections of a railway bridge with a somewhat striking and checkered record. Some 35 years ago at the time when the New York, New Haven & Hartford was replacing its wooden bridges with iron structures the old wooden truss bridge over the Housatonic river between Bridgeport and New Haven was replaced. It was noted at the time that it seemed structurally slender but its grace of design and beauty of truss and chord made it the theme alike of popular and official eulogy. For months after it was finished and when, under the old Connecticut statute, every train had to stop at a drawbridge, it was "heads out" for the passengers in admiration of the new structure.



Adaptation of Old N. Y., N. H. & H. Bridge for Highway and Trolley Traffic. Length of Draw Span and Annexed Span About 400 ft. In Use Since 1885.

All went well until a few years later when a young student of the Yale Scientific School took the bridge as the subject of his graduating thesis. He visited the bridge, took his measurements, applied to them the formulas for strength of shape and material, and demonstrated that the bridge was structurally weak and very dangerous for traffic.

The thesis was submitted to the authorities of the school who kept it a deep secret but confirmed its figures and conclusions. They in turn submitted the thesis to the President and engineering experts of the New Haven Company. The experts, to the President's amazement, confirmed the *dicta* of the thesis. The almost new bridge came down right away, to be superseded by a structure less ornate but more stalwart. A crisis which had cost the President much anxiety was disguised in his next annual report by his emphasis on heavier traffic, larger train loads, dispraise of old cast-iron designs and praise of the new bridge "over which trains run as freely as they do over terra firma." Within a few years that bridge itself has had to be displaced by a much heavier one to sustain increased train load.

A little later a part of the old "poetic" cast-iron bridge was bought of the railway company to be used as sections of the ancient Tomlinson's drawbridge between the city of New Haven and the East Haven shore, where for 24 years it has served well for general highway and trolley car traffic and for those purposes is apparently in as good condition as ever though, in parts, it has had to be strengthened. The draw-span is that of the original bridge and, with the annexed span, also a part of the original structure, covers a distance of about 400 feet.

Pennsylvania Track Prizes.

The prizes awarded by the Pennsylvania Railroad for excellence in track maintenance during 1908 amount to $10,860. The premiums awarded by the General Manager went in pairs to the supervisor and his assistant, as follows: C. M. Wisman, 800, and J. D. Lovell, 400, for best line and surface on the main line during entire year; G. C. Koons, 700, and H. H. Garrigues, 300, greatest improvement in line and surface on main line during entire year; H. L. Thomas, 600, and M. W. Clement, 200, best line and surface on Philadelphia division during entire year; J. A. Burchenal and T. E. Lightfoot,

best line and surface on Middle division; C. I. Leiper and W. W. Hubley, best line and surface on Pittsburgh division; G. Goldie, Jr., and H. A. John, Jr., best line and surface on Maryland division.

The foregoing premiums are based on inspections made about every six weeks throughout the year between Jersey City, Pittsburgh, Philadelphia and Washington, by a committee consisting of the Chief Engineer of Maintenance of Way, the Engineer of Maintenance of Way, and three branch line division Superintendents, who make the trips in a special car attached to one of the fast trains in each direction, and a careful observation is made by means of instruments specially constructed to indicate imperfect line and surface.

Premiums are awarded by the General Superintendents to those among the 1,500 track foremen who achieve the best results for the year. Those over $25 went to the following, each being $50 except as noted:

E. J. McGuire (60), James Coote, T. Prindaville, J. M. Cahill, John Cooke, J. McDaid, C. Calter, R. L. Baird (100), G. Althouse (60), John Small, J. Johnston, J. K. Weaver, G. A. Kohler, A. Rodman, C. W. Urban, H. Murray, E. B. John (100), B. F. Garver (60), M. Klinedinst, G. F. Wagner, D. Hawk, S. P. Lightner, J. H. Martin, A. Treese, G. Ehrenfeld (100), G. J. Stahley, William Johns, H. H. Mumma, J. G. Blair, J. E. Bishop, A. A. Raffensperger, B. F. Mount, F. L. Yeager, Henry Aul, J. B. Elmer (60), Michael Lay, Harry Boyd, J. E. Rollins, C. J. Dinsey, W. K. Mangum, P. Hayden, J. F. Thomas, S. F. Miller, W. T. Lego, J. Welch, T. Woomer, J. Yannutz, A. Cosel, F. J. Wills, J. A. Toy, D. W. Phillips, T. H. Duncan, P. Dempsey, J. A. Granato, J. L. Nolan, B. T. Rust (60), D. I. Allen, J. Coverdale, G. Walker, A. F. Slade, A. Johnson, J. F. Burgie, J. Murphy, J. E. Winters, C. Mancus, J. Lynch, J. Mostacato, Wm. Hartman, J. W. Freeman, J. Sheehan, C. H. Wyant, G. L. Welch, Wm. E. Brown, A. W. McClellan, E. J. Ayars, E. S. Hippey, J. Bergen. Nineteen foremen received $25 each.

On the Long Island Railroad awards were made as follows: C. F. Dunbar (100), C. King (50), A. E. Weinberger (50), Frank Ferrulla (25). Dominick Panullo and Mike Geraldo were tied for first place and each received $37.50. Wm. Meilke and J. Reuger, were also tied and received $37.50 each., Martin Conway received 50 and F. E. Turner, 25.

Prizes on the Cumberland Valley amounting to $305 were awarded to C. A. Gribble (80), John C. Wagner (60), H. R. Meredith (40), Urge Shoap, (25), S. N. Rook (30), A. F. Kohler (20), John Gray (25), A. J. Dehart, (25).

For the coming year the Cumberland Valley will increase its prizes from 25 to 60 per cent.

London Electric Railways.

For the present, the London & North Western Railway, which was going to relieve its lines out from Euston terminus by an electric railway partly tube and partly surface out as far as Watford, is still obliged to defer the carrying out of the underground section, but it has during the past year done work in connection with the surface track. The matter had to be deferred originally owing to the state of the money market, a reason which has held back many other important enterprises which English engineers would have liked to get to work upon. The Central London Railway is applying for parliamentary powers enabling it to extend its line from the Bank (City) station to and under the Liverpool street station of the Great Eastern Railway, where it will also have connection with another railway serving north and northeast London suburbs. This new section is one that has often been thought about, and it will undoubtedly afford a greatly needed connection. At the present time the passenger leaving the tube trains at the Bank has to proceed either by omnibus or for ten minutes on foot through very crowded city streets, before he reaches the Liverpool street terminus. It is to be hoped that the Central London will succeed in getting its bill through. For this and other improvements, capital and borrowing powers for $2,200,000 are sought. Last year the Central London benefited greatly from the traffic to the Shepherd's Bush (Franco-British) exhibition, for which it laid a short additional length of line. For the last half of the year the average receipt per passenger was 4.06 cents as compared with 4.02 cents in 1907, while the cost per passenger was only 2.04 cents as compared with 2.56 cents in 1907—the increase of 5,350,003 passengers being responsible for these improved results. The Central London directors have not got to the end of their fare troubles, for they say that it may yet be necessary to make further alterations in the scale in order to meet surface competition on more equal terms, such competition having been specially felt since the closing of the exhibition. As the Shepherd's Bush site is to be used again this year for another great show (Imperial Exhibition), the C. L. will again reap benefit, but probably not to the same extent.

It is announced that the City & South London, which has from the beginning proceeded so very cautiously with the construction of short sections outward to the north and to the south of London, is about to undertake one more step. Its last completed section was the connection of Islington to Euston for tapping the great incoming traffic from suburban areas served by the London & North Western. The scheme now reported to be in preparation for Parliament to consider relates to the other end of the tube which it is proposed to carry on from the present terminus at Clapham to Balham and Tooting.

It is intended to start running the electric trains on the London, Brighton & South Coast single-phase alternating section between London bridge and certain stations near it very shortly. The line between Battersea Park and Peckham is the first to be completed, and experimental working is in progress.

MEETINGS AND CONVENTIONS.

The following list gives names of secretaries, dates of next or regular meetings, and places of meeting.

AIR BRAKE ASSOCIATION.—F. M. Nellis, 53 State St., Boston, Mass.; May 11-14, 1909; Richmond, Va.

AMERICAN ASSOCIATION OF DEMURRAGE OFFICERS.—A. G. Thomason, Scranton, Pa.; May 11; St. Louis, Mo.

AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS.—R. W. Pope, 33 West 39th street, New York; second Friday in month; New York.

AMERICAN RAILWAY ASSOCIATION.—W. F. Allen, 24 Park Place, New York; May 19, 1909; New York.

AMERICAN RAILWAY BRIDGE AND BUILDING ASSOCIATION.—S. F. Patterson, B. & M., Concord, N. H.; Oct. 19, 1909; Jacksonville, Fla.

AMERICAN RAILWAY ENGINEERING AND MAINT. OF WAY ASSOC.—E. H. Fritch, Monadnock Bldg., Chicago; March 16-18, 1909; Chicago.

AMERICAN RAILWAY MASTER MECHANICS' ASSOCIATION.—J. W. Taylor, Old Colony Bldg., Chicago; June 16-18, 1909; Atlantic City.

AMERICAN SOCIETY OF CIVIL ENGINEERS.—C. W. Hunt, 220 W. 57th St.; N. Y.; 1st and 3d Wed., except July and August; New York.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS.—Calvin W. Rice, 29 W. 39th St., N.Y.; 2d Tues. in month; annual, Dec. 7-10; New York.

AMERICAN STREET AND INTERURBAN RAILWAY ASSOCIATION.—B. V. Swenson, 29 W. 39th St., New York.

ASSOCIATION OF AMERICAN RAILWAY ACCOUNTING OFFICERS.—C. G. Phillips, 143 Dearborn St., Chicago; April 28, 1909; Cincinnati.

ASSOCIATION OF RAILWAY CLAIM AGENTS.—E. H. Hemus, A., T. & S. F., Topeka, Kan.; last week in May, 1909; Detroit, Mich.

ASSOCIATION OF RAILWAY TELEGRAPH SUPERINTENDENTS.—P. W. Drew, Wisconsin Central Ry., Chicago; June 23-25, 1909; Detroit.

ASSOCIATION OF TRANSPORTATION AND CAR ACCOUNTING OFFICERS.—G. P. Conard, 24 Park Pl., New York; June 22-23; Montreal.

CANADIAN RAILWAY CLUB.—James Powell, Grand Trunk Ry., Montreal, Que.; 1st Tues. in month, except June, July and Aug.; Montreal.

CANADIAN SOCIETY OF CIVIL ENGINEERS.—Clement H. McLeod, Montreal, Que.; irregular, usually weekly; Montreal.

CENTRAL RAILWAY CLUB.—H. D. Vought, 95 Liberty St., New York; 2d Friday in January, March, May, Sept. and Nov.; Buffalo.

FREIGHT CLAIM ASSOCIATION.—Warren P. Taylor, Rich., Fred. & Pot. R.R., Richmond, Va.; June 16, 1909; Old Point Comfort, Va.

INTERNATIONAL MASTER BOILER MAKERS' ASSOCIATION.—Harry D. Vought, 95 Liberty St., N. Y.; April 27-30, 1909; Louisville, Ky.

INTERNATIONAL RAILWAY FUEL ASSOCIATION.—D. B. Sebastian, La Salle St. Station, Chicago; June 21-23, 1909; Chicago.

INTERNATIONAL RAILWAY GENERAL FOREMEN'S ASSOCIATION.—E. C. Cook, Royal Insurance Bldg., Chicago; June 1-5; Chicago.

IOWA RAILWAY CLUB.—W. B. Harrison, Union Station, Des Moines, Ia.; 2d Friday in month, except July and August; Des Moines.

MASTER CAR BUILDERS' ASSOCIATION.—J. W. Taylor, Old Colony Bldg., Chicago; June 21-23, 1909; Atlantic City.

NEW ENGLAND RAILROAD CLUB.—G. H. Frazier, 10 Oliver St., Boston, Mass.; 2d Tues. in mnth, ex. June, July, Aug. and Sept.; Boston.

NEW YORK RAILROAD CLUB.—H. D. Vought, 95 Liberty St., New York; 3d Friday, in month, except June, July and August; New York.

NORTH-WEST RAILWAY CLUB.—T. W. Flannagan, Soo Line, Minn.; 1st Tues. after 2d Mon., ex. June, July, Aug.; St. Paul and Minn.

RAILWAY CLUB OF PITTSBURGH.—J. D. Conway, Pittsburgh, Pa.; 4th Friday in month, except June, July and August; Pittsburgh.

RAILWAY SIGNAL ASSOCIATION.—C. C. Rosenberg, 12 North Linden St., Bethlehem, Pa.; March 15, 1909; Chicago.

RAILWAY STOREKEEPERS' ASSOCIATION.—J. P. Murphy, Box C, Collinwood, Ohio; May 17-19; Chicago.

ROADMASTERS' AND MAINTENANCE OF WAY ASSOCIATION.—Walter E. Emery, P. & P. U. Ry., Peoria, Ill.; Nov., 1909; Washington.

ST. LOUIS RAILWAY CLUB.—B. W. Frauenthal, Union Station, St. Louis, Mo.; 2d Friday in month, except June, July and Aug.; St. Louis.

SOUTHERN ASSOCIATION OF CAR SERVICE OFFICERS.—J. H. O'Donnell, Bogalusa, La.; April 15; Atlanta, Ga.

SOUTHERN AND SOUTHWESTERN RY. CLUB.—A. J. Merrill, Prudential Bldg., Atlanta; 3d Thurs., Jan., April, Aug. and Nov.; Atlanta.

TRAVELING ENGINEERS' ASSOCIATION.—W. O. Thompson, N. Y. C. & H. R. R.R., East Buffalo, N. Y.; September, 1909; Denver.

WESTERN RAILWAY CLUB.—J. W. Taylor, Old Colony Bldg., Chicago; 3d Tuesday each month except June, July and August; Chicago.

WESTERN SOCIETY OF ENGINEERS.—J. H. Warder, Monadnock Bldg., Chicago; 1st Wednesday, except July and August; Chicago.

St. Louis Railway Club.

At the regular monthly meeting on March 12 a paper will be presented by D. T. Taylor, General Foreman Car Department, St. Louis & Santa Fe, Monett, Mo., entitled "The Piece or Premium System of Organization; Development and Economy; Day-Work Fallacy Exposed."

Illinois Fuel Conference.

The program for the Illinois Fuel Conference at the University of Illinois, March 11, 12 and 13, consists principally of addresses on mining subjects, including mine explosions, first aid, smoke suppression, coal analysis, work of the United States Geological Survey, the Illinois State Geological Survey and the University of Illinois engineering experiment station.

Canadian Society of Civil Engineers.

At a meeting of the General Section held on March 11, a paper on Foundations of the Manhattan Life building, New York, by T. Kennard Thomson, was read by the author and illustrated with lantern slides.

Traffic News.

The committee on common carriers of the Texas House has reported adversely on the 2-cent fare bill.

The lines in Western Classification territory have extended indefinitely the time during which old shipping tickets may be used with the statement stamped upon them that shipments are received subject to the uniform bill of lading.

The Interstate Commerce Commission announces that the Canadian Pacific Railway and the Quaker Oats Co. have been indicted in Vermont on charges connected with the transportation of grain products from Richford, Vt., to Boston, free of charge.

Representatives of the Pennsylvania Lines, the Erie, the Southern, the Norfolk & Western, the Baltimore & Ohio, the Chesapeake & Ohio and the Cumberland Gap Despatch, at a recent meeting in Cincinnati, decided to make the same rates on grain on the opening of lake navigation as were made last season.

The Chicago & Eastern Illinois has established a new package and refrigerator car service between Chicago and southern points. Three cars will hereafter leave Chicago at 6:45 p.m. with through shipments for Atlanta, New Orleans, Mobile and Jacksonville and points beyond. The schedule calls for a running time to Atlanta of 54 hours.

A press despatch from Topeka, March 9, says that the upper house of the Kansas legislature has rejected the 2-cent fare bill which was passed by the lower house. This ends the 2-cent fare legislation in Kansas at this session. The Senate, however, passed the maximum freight rate bill, reducing the rates in the state 5 to 15 per cent. The bill already had been passed by the House.

The National Wholesale Lumber Dealers' Association has adopted resolutions setting forth that the lumber dealers of the country depend largely for their prosperity on the prosperity of the railways and that it is important that the earnings of railways should enable them to maintain normal operation and proper facilities. The association, therefore, urges Congress and the state legislatures to be moderate in the regulation of railways.

At a conference held in New York City last week the roads interested are said to have agreed on an advance of five cents per 100 lbs. in the rates for carrying bituminous coal from West Virginia to Lake Erie and other points in the West. Where the rate has been 97 cents per 100 lbs., it will be $1.02. The main object of the conference, it is said, was to settle controversies concerning the relation of these rates to the rates on coal from mines in western Pennsylvania and Ohio; but the subject had to be continued for further discussion this week.

The Wabash and the Union Pacific have made an arrangement for new joint through daily passenger service between St. Louis and Denver via Kansas City. The new train will be put on April 4. Westbound, it will leave St. Louis at 2.30 p.m. and arrive at Kansas City at 9.55 p.m.; leave Kansas City at 11.15 p.m. and arrive at Denver at 5.20 p.m. Eastbound, the train will leave Denver at 12 o'clock, noon, and arrive at Kansas City at 8.05 a.m.; leave Kansas City at 9.15 a.m. and arrive at St. Louis at 5.45 p.m. The train will connect with through trains of the Union Pacific for the Pacific coast, and through cars to the coast may later be put on. The train will have an observation 10-section sleeper, a 12-section and drawing-room sleeper and a chair car, all to be electric lighted.

P. W. Coyle, Commissioner of the Freight Bureau of the Business Men's League of St. Louis, has received from Hon. E. E. Clark, of the Interstate Commerce Commission, a letter to the effect that the duty of a carrier to take all necessary steps to collect the full tariff rate—that is, to recover under charges—is not so rigidly limited as might appear from the Commission's Bulletin No. 1. The law does not place upon the carrier a greater obligation to collect under charges from the consignee than from the consignor. There are numerous instances in which the consignor is the party who is responsible for the freight charges. It was therefore an erroneous statement in the Bulletin to add the words "from the consignee."

The Freight Bureau of the Business Men's League of St. Louis, of which P. W. Coyle is Commissioner and A. F. Versen, Secretary, has issued a circular to its members, calling attention to the excessive number of complaints filed with the Interstate Commerce Commission. One railway, with headquarters in St. Louis, receives on an average four formal complaints a day which it must defend before the commission. The Freight Bureau suggests that many of these proceedings before the commission could be avoided if the members of the bureau who have apparent ground for complaint would submit the facts to the bureau for consideration. This, it is believed, would result in better co-operation and less friction between the shippers and the carriers.

The decision of the United States Circuit Court in the Missouri 2-cent fare case, reported elsewhere, is taken to indicate that no 2-cent fare law can be successfully defended in the federal courts in any state west of the Mississippi river. It is regarded, therefore, as probable that it will not be long before passenger rates in territory west of the Mississippi river will have been put on a basis of 2½ cents or 3 cents a mile. Passenger traffic officers of Missouri lines express the opinion that they will be able to raise all Missouri rates, both state and interstate. As Judge McPherson, in his decision holding the 2-cent fare law invalid, intimated that he believed that 2½ cents for the stronger lines and 3 cents for the weaker lines would be a fair and reasonable rate, it is not improbable that these rates will be adopted. However, owing to Missouri's central location, a readjustment of rates in that state will involve a very extensive readjustment of interstate rates, and there will probably be greater delays in raising the rates in Missouri than there were in raising them in Arkansas, where the number of lines is much smaller and the conditions less complex. The Attorney-General of Missouri says that he will immediately appeal the rate cases to the Supreme Court of the United States. A press despatch from Detroit says that Michigan railways intend to fight the state railway law unless the state authorities either reduce the valuations put on railways or repeal the 2-cent fare law, so that the roads can earn 6 per cent. on the valuation placed on them by the tax commission.

COURT NEWS.

The Arkansas Supreme Court returned a decision on March 1 sustaining the constitutionality of the so-called Barker demurrage law, which was passed by the state legislature in 1907, in so far as it applies merely to intrastate business. Judge Trieber, of the Federal court, has held this law unconstitutional so far as it applies to interstate business.

Judge Trieber, of the United States Circuit Court, has refused to grant the petition of the Arkansas Railroad Commission, asking for the dissolution of the injunction granted by Judge Vandeventer restraining the enforcement of the 2-cent pasenger fare law and the orders of the commission

reducing freight rates in Arkansas. The request of the commission that the railways be required to modify the rates that they have put in since the injunction was issued will be taken up for consideration on March 29.

Ralph M. Shaw, of counsel for the Chicago & Alton, paid into the United States District Court at Chicago on March 1 $60,000, being the total amount of fines imposed upon the Alton, its former Vice-President, J. N. Faithorn, and its former General Freight Agent, F. A. Wann, for the payment of rebates to the Schwarzschild & Sulzberger Co., at Kansas City.

The Supreme Court of the state of Washington on March 1 rendered three decisions sustaining the right of the State Railroad Commission to fix rates. One of the cases grew out of an appeal by the Great Northern from an order by the commission requiring certain specified joint rates on wheat. The Great Northern contended that under the state constitution no public authority except the legislature could exercise the power of fixing rates. The Supreme Court held that after the legislature had provided that rates must be fair, just, reasonable and adequate, it might delegate the administrative duty of fixing them to the commission. This finding conflicts with a decision rendered last summer by Judge Hanford of the Federal Court at Seattle. The State Supreme Court held that while the constitution recognizes a division of the powers of the state into legislative, executive and judicial, they need not be kept wholly distinct. In a case appealed by the Oregon Railroad & Navigation Co. the court upheld the power of the commission to require reasonable physical track connections. This grew out of orders of the commission requiring the Northern Pacific, the Spokane & Inland Empire and the O. R. & N. to make connections at Oaksdale and Garfield; the Northern Pacific and O. R. & N. at Connell, Pullman and Farmington; the O. R. & N. and the Spokane & Inland at Waverly, Thornton and Colfax, and the Northern Pacific and Spokane & Inland at Rosalia and Palouse. The court in its third decision upheld an order of the commission establishing joint rates on potatoes.

Questions asked and remarks made by Judge Anderson, who is trying in the Federal court at Chicago the case of the government against the Standard Oil Company of Indiana for the alleged acceptance of rebates from the Chicago & Alton, indicate a possibility that the entire proceeding may be dismissed because of the government's inability to prove that the 18-cent and 19½-cent rates, which it declares were the legal rates for the transportation of oil from Whiting, Ind., to East St. Louis, Ill., and from Chappell, Ill., to St. Louis, were actually ever legally in effect, as applied to interstate traffic. The rate of 18 cents was the intrastate rate from Chappell, Ill., to East St. Louis. Similarly, the 19½-cent was the rate from Chappell to East St. Louis, with the charge of the Wiggins Ferry from East St. Louis to St. Louis, added. The government sought to show the legality of the 18-cent rate from Whiting to East St. Louis by introducing in evidence Interstate Commerce Commission application sheet No. 1,203, by which the Chicago Terminal Transfer Railroad, the originating road, purported to apply the Chappell rate from Whiting. Counsel for the Standard Oil Company contended that this was not a legal publication and filing of this rate for interstate business, because the Alton had never concurred in it. Consequently the 18-cent rate could not legally be applied upon an interstate shipment from Whiting to East St. Louis, and therefore the allegation in the indictment that the 18-cent rate was the only legal rate was untrue. The 19½-cent rate to St. Louis was attacked similarly upon the ground that the Alton had never concurred in the Wiggins Ferry's application sheet. The rates actually collected, it will be recalled, were 6 cents from Whiting to East St. Louis and 7½ cents from Chappell to St. Louis. Judge Anderson remarked that he had grave doubts whether the evidence that the government had introduced was sufficient to show the legality of the higher rates; for the government must, in order to prove that an illegal concession had been made, show that there was a legal standard—that is, a legal rate—and that this standard had been violated. He said that there was no evidence as yet of the existence of any such legal standard. As we go to press it is understood that the government has abandoned the suit.

INTERSTATE COMMERCE COMMISSION.

Stoppage-in-Transit for Structural Iron.

Indianapolis Freight Bureau v. Cleveland, Cincinnati, Chicago & St. Louis et al. No. 1045. Opinion by Commissioner Clements.

Defendants' rule governing the loading of long ladders in Official Classification territory should be modified so as to provide for the shipment of one dozen ladders at actual weight by fixing the minimum at 1,800 pounds.

Since the hearing several defendants have issued tariffs allowing stoppage in transit at Indianapolis for fabrication of structural iron and reshipment at the through rate from point of origin to final destination, provided Indianapolis is intermediate, a charge of 1½ cents per 100 lbs. to be made for the incidental service. In view of this development, the complaint as to this feature is dismissed without prejudice.

Reparation Not a Matter of Course.

Morse Produce Co. v. Chicago, Milwaukee & St. Paul. No. 1490. Opinion by Commissioner Cockrell.

Complainant, in a petition which did not claim reparation, had heretofore alleged that certain rates were unjust, unreasonable and discriminatory; and the commission, after full hearing, condemned said rates as unjust, and prescribed maximum rates to apply thereafter. The carrier complied with the order of the commission. Thereafter the complainant filed the present petition, based on the shipments and facts set forth in his former complaint, and asked for reparation in an amount equal to the difference between the aggregate sum actually collected by the carrier under the old rates and the sum it should have collected if the rate which the commission had declared reasonable had been in effect. The petition should have stated the whole case, including any reparation claimed, and it does not necessarily follow that reparation will be awarded in all cases on the basis of a rate prescribed to be observed thereafter. On the facts in this case reparation is denied.

Loss of Weight in Elevation.

Baltimore Chamber of Commerce v. the Pennsylvania et al. No. 1821. Opinion by Commissioner Harlan.

The defendants issue certificates for the actual weight of grain shipments going into their elevators at Baltimore, and on that weight assess their transportation and elevator charges; but each certificate shows on its face the "scaleage deduction" that will be made, on the basis of published tariff estimates, when the grain is delivered out of the elevator to the certificate holder. The complaint alleges that these deductions are arbitrary and constitute an illegal appropriation of the property of the complainant's members and others who ship grain to Baltimore, Md.

The defendants by this practice are not exacting from grain shippers either a rate, in the form of grain, or an addition to a rate, and therefore the question presented is not one of rates. Neither is the practice one affecting rates, as the tariff rules are simply notice that while the shipment weighed so much when taken into the elevator, the grain will weigh so much less when it goes out, because of the weight of dirt, dust, chaff and moisture, which, in the process of elevation, will disappear and cannot therefore be delivered to the holder of the elevator certificate when the grain is ordered out. So long as the deductions are based on reasonable estimates of the weight of foreign matter that is unavoidably eliminated and lost in the process of elevation the practice is not one that affects rates or has any real relation to rates.

The practice of one defendant herein of supplying at its New York elevators enough grain to make up the weight of dirt, chaff and moisture lost in the process of elevation is a practice affecting rates, in that it is an advantage or benefit that the shipper gets under the published rate; but the charge that the making of deductions at Baltimore and not at New York is unduly prejudicial to Baltimore is not now considered, the record not having been made with a view to the disposition of the complaint on that ground.

REPORTS OF REVENUES AND EXPENSES OF RAILWAYS.

MONTH OF JANUARY, 1909.
(See also issue of March 5.)

Name of road.	Mileage operated at end of period.	Operating revenues			Operating expenses						Net operating revenues (or deficit).	Outside operations. net.	Taxes.	Operating income (or loss).	Increase (or dec.) comp. with last year.
		Freight.	Passenger.	Total, inc. misc.	Maintenance Way and structures.	Maintenance Of equipment.	Traffic.	Transportation.	General.	Total.					
Atchison, Topeka & Santa Fe	7,458	$3,959,059	$1,584,760	$6,063,475	$790,218	$827,601	$156,256	$1,786,026	$147,337	$3,707,438	$2,356,037	.....	$231,472	$2,124,565	$492,989
Atlantic Coast Line	4,409	1,542,039	531,308	2,266,315	298,700	290,445	40,662	732,110	66,785	1,428,702	837,613	.....	90,000	747,613	402,819
Baltimore & Ohio	3,992	4,090,408	928,804	5,363,454	636,321	940,145	128,243	2,124,003	125,669	3,954,381	1,409,073	$63,317†	180,084	1,165,672	341,471
Boston & Maine	2,242	1,794,481	876,830	2,919,249	242,730	382,700	36,897	1,446,607	77,745	2,186,679	732,570	8,494	157,971	583,093	301,123
Central of Georgia	1,916	618,888	209,864	914,556	120,056	176,594	26,838	297,202	35,854	656,544	258,012	4,950	38,782	224,180	56,143
Central of New Jersey	668	1,319,152	306,084	1,726,952	151,396	307,230	22,115	509,993	37,045	1,027,779	699,173	43,591†	83,754	571,828	36,202
Chesapeake & Ohio	1,896	1,705,735	317,618	2,109,652	208,528	444,803	36,897	672,801	44,360	1,407,389	702,263	5,527†	67,100	629,636	205,206
Chicago & Eastern Illinois	966	675,530	134,989	863,235	91,262	160,666	13,867	343,346	33,651	642,792	220,443	2,544†	26,500	191,399	‡51,056
Chicago, Milwaukee & St. Paul	7,516	3,077,007	835,647	4,308,998	351,797	631,561	109,519	1,831,611	104,796	3,029,284	1,279,714	6,941†	206,645	1,066,128	‡104,397
Chicago, Rock Island & Pacific	7,414	2,939,790	1,250,168	4,475,497	618,019	619,447	116,113	1,868,794	133,819	3,356,192	1,119,305	15,240†	179,925	924,140	‡7,574
Cleveland, Cincinnati, Chicago & St. L.	1,982	1,319,601	517,190	2,024,965	159,049	402,895	69,142	895,015	47,186	1,573,287	451,678	7,120†	74,000	370,558	118,949
Colorado & Southern	1,248	589,081	100,984	729,619	73,019	145,295	12,800	235,742	25,797	492,653	236,966	158†	21,225	215,583	‡22,313
Delaware & Hudson	845	1,182,369	159,946	1,464,686	102,594	184,987	17,885	603,229	35,600	944,295	520,391	422†	35,000	484,969	4,185
Denver & Rio Grande	2,516	1,210,075	289,354	1,569,468	149,676	328,273	32,413	643,194	57,609	1,211,165	358,303	2,068†	65,000	291,235	‡96,597
Erie	1,902	2,241,626	557,905	3,069,350	223,035	649,495	86,280	1,248,196	77,541	2,284,547	784,803	20,555†	106,084	658,164	372,319
Galveston, Harrisburg & San Antonio	1,339	564,477	191,155	800,977	133,450	110,176	21,845	321,894	27,186	614,551	186,426	826†	28,179	157,421	124,330
Great Northern	6,899	1,808,191	673,349	2,729,995	537,429	574,740	58,280	1,190,272	89,237	2,449,958	280,037	7,694	251,490	36,241	‡327,760
Gulf, Colorado & Santa Fe	1,518	771,650	233,835	1,058,597	152,559	137,439	21,111	421,197	30,308	762,614	295,983	.....	31,864	264,119	145,297
Illinois Central	4,519	3,087,405	849,016	4,519,965	405,543	864,814	92,965	1,647,918	92,925	3,104,165	1,415,800	3,093†	186,328	1,226,379	280,531
Lake Erie & Western	724	252,037	48,033	319,859	34,571	90,738	10,594	142,678	11,997	290,578	29,281	.....	17,000	12,281	‡23,154
Lake Shore & Michigan Southern	1,511	2,152,602	733,562	3,316,725	230,143	534,577	83,966	1,188,581	52,196	2,089,463	1,227,262	2,419†	125,000	1,099,843	372,647
Michigan Central	1,746	1,288,500	447,904	1,907,660	168,803	309,034	55,030	830,704	36,499	1,400,071	507,589	3,917†	94,000	409,672	74,618
Missouri Kansas & Texas	3,072	1,297,280	581,423	2,005,218	295,032	307,038	48,605	846,599	73,367	1,570,641	434,577	1,145†	69,175	364,257	‡81,191
Mobile & Ohio	926	596,832	98,262	810,477	78,204	128,338	30,202	290,825	29,373	556,942	253,535	2,626†	20,000	230,909	61,998
Nashville, Chattanooga & St. Louis	1,230	687,962	202,169	959,959	137,816	181,661	35,572	339,643	22,951	717,643	242,316	4	20,000	222,320	93,631
New York Central & Hudson River	3,587	3,940,501	1,899,824	6,549,606	573,200	1,307,654	175,236	2,847,734	209,742	5,113,566	1,436,040	2,571	353,435	1,085,176	307,483
Norfolk & Western	1,921	1,953,730	276,479	2,310,699	251,968	399,372	42,711	690,579	52,145	1,436,775	873,924	208†	82,300	791,416	266,360
Oregon Short Line	1,456	894,216	274,399	1,250,066	72,321	148,129	21,208	291,497	32,068	565,223	684,843	738†	50,000	634,105	276,537
St. Louis Southwestern	773	419,853	100,251	545,889	93,484	95,569	21,807	151,060	19,852	381,772	164,117	527†	14,992	148,598	4,050
St. Louis Southwestern of Texas	697	202,252	66,064	289,012	90,257	68,002	11,316	140,799	16,100	326,474	37,462*	389†	4,448	42,299†	18,044
Southern	7,016	2,703,453	1,033,324	4,035,975	459,459	656,734	101,545	1,564,737	148,392	2,930,867	1,105,108	9,234	155,656	958,686	525,774
Texas & New Orleans	450	187,840	69,680	279,506	73,022	42,598	5,745	161,322	8,109	290,796	11,290*	628†	11,600	23,518†	‡58,901
Texas & Pacific	1,885	884,508	294,737	1,246,809	151,576	201,913	17,151	500,459	34,168	905,267	341,542	2,136†	38,000	301,406	55,509
Union Pacific	3,310	2,224,704	736,182	3,284,415	208,006	451,412	79,625	947,229	103,912	1,790,184	1,494,231	5,585†	111,783	1,376,863	371,516
Wabash	2,515	1,354,721	445,295	1,986,148	197,229	334,010	71,184	875,433	102,648	1,580,504	405,644	2,293†	68,216	335,135	‡53,987
Yazoo & Mississippi Valley	1,371	674,801	186,549	914,182	152,275	138,146	14,792	338,875	21,715	665,803	248,379	2,022	30,835	219,566	‡4,366
SEVEN MONTHS OF FISCAL YEAR.															
Atchison, Topeka & Santa Fe	7,458	29,739,004	10,782,257	43,991,036	5,578,038	7,125,004	909,470	11,870,720	934,376	26,417,608	17,573,428	.....	1,395,734	16,177,694	2,557,602
Atlantic Coast Line	4,409	10,162,594	3,265,974	14,491,924	2,053,456	2,100,206	243,277	4,847,191	418,787	9,662,917	4,829,007	.....	630,000	4,199,007	1,088,573
Baltimore & Ohio	3,992	32,091,922	7,785,362	42,328,336	5,008,457	6,235,155	914,384	14,574,389	846,062	27,578,447	14,749,889	319,352†	1,199,569	13,230,968	587,519
Boston & Maine	2,242	13,259,773	8,351,784	23,391,753	2,792,426	2,579,968	278,832	10,403,642	535,108	16,589,976	6,801,777	75,705	1,017,748	5,859,734	130,048
Central of Georgia	1,916	4,575,435	1,723,978	6,893,362	930,702	1,253,842	184,263	2,112,795	255,767	4,746,369	2,146,993	36,085	268,960	1,914,118	217,798
Central of New Jersey	668	9,550,666	2,562,517	12,819,404	1,270,499	2,152,289	181,169	3,469,638	259,400	7,332,995	5,486,409	250,105	617,743	5,118,771	‡582,942
Chesapeake & Ohio	1,896	12,172,153	2,704,770	15,512,574	1,762,015	2,927,173	253,813	4,262,672	297,896	9,503,569	6,009,005	9,179†	466,100	5,533,726	262,507
Chicago & Eastern Illinois	966	4,830,009	1,036,097	6,221,185	705,083	1,156,563	110,430	2,186,585	243,984	4,402,645	1,818,540	11,107†	141,615	1,665,818	‡176,844
Chicago, Milwaukee & St. Paul	7,516	25,961,064	7,998,198	36,816,798	4,457,901	4,396,340	766,592	12,813,319	633,659	23,067,811	13,748,987	157,842	1,395,500	12,511,329	150,890
Chicago, Rock Island & Pacific	7,414	22,012,138	10,420,879	34,492,005	5,328,323	4,447,773	776,773	12,637,956	889,624	24,080,449	10,411,556	76,665†	1,285,639	9,049,252	154,651
Cleveland, Cincinnati, Chicago & St. L.	1,982	9,759,125	4,240,345	15,466,873	1,703,347	2,718,058	489,731	6,094,285	307,782	11,313,203	4,153,670	21,119†	485,348	3,647,203	224,080
Colorado & Southern	1,248	4,037,959	966,541	5,276,917	652,721	899,818	97,865	1,607,393	183,501	3,441,298	1,835,619	2,049	146,746	1,690,922	‡23,476
Delaware & Hudson	845	8,945,417	1,784,980	11,075,263	775,309	1,155,473	132,349	3,835,346	246,778	6,145,255	4,930,008	15†	241,748	4,688,245	‡521,822
Denver & Rio Grande	2,516	8,928,837	3,034,955	12,528,224	1,396,031	2,040,820	267,604	4,260,610	370,663	8,335,728	4,192,496	35,807	454,750	3,773,553	‡666,504
Erie	1,902	18,654,156	4,921,798	25,363,631	2,628,928	5,150,722	544,563	8,683,932	536,816	17,544,961	7,818,670	241,797	694,694	7,365,773	1,855,754
Galveston, Harrisburg & San Antonio	1,339	4,575,125	1,255,769	6,132,181	762,902	732,144	148,193	2,398,112	185,917	4,227,268	1,904,913	16,146†	120,865	1,767,902	694,266
Great Northern	6,899	24,984,083	6,671,044	33,535,541	5,850,097	3,931,715	411,560	8,871,680	596,686	19,661,738	13,873,803	154,415	1,499,877	12,528,341	‡694,373
Gulf, Colorado & Santa Fe	1,518	5,894,997	1,808,902	8,071,582	1,172,798	1,287,412	140,378	2,728,911	228,807	5,558,306	2,513,276	.....	182,326	2,330,950	1,258,772
Illinois Central	4,519	21,532,473	6,603,375	32,087,968	3,809,317	7,173,223	679,148	10,910,920	672,580	23,245,188	8,842,780	20,853†	1,319,085	7,502,842	28,142
Lake Erie & Western	724	1,969,508	491,234	2,599,356	363,081	500,214	76,588	1,006,986	72,944	2,019,813	579,543	.....	119,760	459,783	‡74,600
Lake Shore & Michigan Southern	1,511	15,699,834	5,825,845	24,557,076	2,914,916	3,456,753	592,867	7,713,920	393,299	15,071,755	9,485,321	14,118†	898,647	8,572,556	353,551
Michigan Central	1,746	9,620,243	3,876,579	14,798,891	1,789,430	2,019,925	421,550	5,654,414	245,851	10,131,170	4,667,721	23,773†	659,694	3,984,254	‡647,099
Missouri, Kansas & Texas	3,072	10,689,034	4,285,034	15,797,587	2,031,583	2,401,130	333,939	5,637,351	470,102	10,874,105	4,923,482	7,381†	736,725	4,179,376	‡697,844
Mobile & Ohio	926	4,199,542	733,963	5,735,299	645,296	917,872	193,845	1,960,668	203,334	3,921,015	1,814,284	13,727†	116,500	1,684,056	66,957
Nashville, Chattanooga & St. Louis	1,230	4,519,885	1,541,728	6,504,226	928,424	1,200,909	238,696	2,324,847	159,534	4,852,410	1,651,816	6,649†	140,000	1,505,167	5,009
New York Central & Hudson River	3,587	29,817,569	16,612,205	51,746,260	6,231,899	8,926,028	1,265,124	18,939,945	1,155,629	36,518,625	15,227,635	141,742	2,711,111	12,658,266	405,797
Norfolk & Western	1,921	14,313,657	2,127,849	17,011,275	1,854,512	2,832,620	273,928	4,899,802	369,071	10,229,933	6,781,342	1,454†	597,300	6,182,588	367,865
Oregon Short Line	1,456	7,511,092	2,402,564	10,530,133	960,124	946,720	131,114	1,995,836	207,844	4,241,638	6,288,495	1,442	348,048	5,941,889	1,054,360
St. Louis Southwestern	773	3,152,787	722,265	4,044,840	538,598	657,770	148,534	995,176	138,730	2,478,808	1,566,032	3,890†	105,142	1,457,000	‡36,996
St. Louis Southwestern of Texas	697	1,602,790	564,576	2,320,876	579,749	463,689	61,341	976,082	108,280	2,189,141	131,735	1,703†	54,332	75,700	104,593
Southern	7,016	20,336,233	8,321,730	31,141,627	3,696,716	4,748,365	702,099	10,853,983	1,012,340	21,013,503	10,128,124	89,319	1,115,221	9,102,222	2,434,312
Texas & New Orleans	450	1,496,158	483,986	2,115,130	373,668	304,271	38,983	900,349	57,220	1,674,491	440,639	6,260†	61,445	372,934	‡28,139
Texas & Pacific	1,885	6,239,745	2,286,791	9,166,564	983,331	1,295,457	106,167	3,369,173	231,343	5,985,471	3,181,093	19,515†	420,740	2,740,838	258,047
Union Pacific	3,310	20,488,397	5,993,871	28,768,363	2,738,196	2,843,726	574,463	6,575,553	709,243	13,441,181	15,327,182	7,653†	762,503	14,557,026	3,865,951
Wabash	2,515	10,123,507	3,971,245	15,345,331	1,674,190	2,269,659	468,805	5,857,315	485,399	10,755,368	4,589,963	8,530†	476,001	4,105,432	‡417,298
Yazoo & Mississippi Valley	1,371	4,376,703	1,312,656	6,051,488	1,188,896	1,058,368	110,908	2,287,234	164,540	4,809,946	1,241,542	20,836	238,375	1,024,003	‡46,815

*Deficit. †Loss. ‡Decrease.

Minimum Carload Weights.

General Chemical Co. v. Norfolk & Western et al. No. 1903. Opinion by Commissioner Harlan.

A tariff naming a rate per ton on a commodity and providing that the minimum carload weight shall be the marked capacity of the car gives the shipper the right to demand any car of recognized standard dimensions suitable for the carriage of that commodity. If on reasonable demand the carrier cannot supply a car of the particular size ordered, it is its duty nevertheless to accept the shipment and move it in any available car or cars, applying the rate on the basis of the marked capacity of the car ordered.

STATE COMMISSIONS.

Louisiana. Rates on Petroleum and Its Products.

The National Petroleum Association and the Marine Oil Company, Limited, v. The Arkansas Southeastern et al. Order 976.

Louisiana has, in recent years, developed extensive oil fields, and the establishment of refineries at several points in the state has developed an industry which the commission holds should be encouraged. Railways operating in Louisiana assess various rates, which are far from being uniform, and in some cases are excessive. Some of the railways have established commodity rates on petroleum oil and its products, which it is not the intention of the commission to disturb. There is not sufficient evidence to warrant reducing the rates on carload lots, but it is abundantly proved, the commission says, that the rates on less than carload shipments should be reduced and made uniform.

The rates which have been proposed by the complainant are, in the opinion of the commission, too low to afford a fair remuneration to the carriers, and the commission adopts the following L.C.L. rates (cents per 100 lbs.):

Miles	Rate, cts.	Miles	Rate, cts.
5 and under	7.0	100 and over 95	16.5
10 " over 5	7.5	110 " " 100	17.0
15 " " 10	8.0	120 " " 110	17.5
20 " " 15	8.5	200 " " 190	21.5
[And so on, 5 mills increase for each 5 miles up to 100 miles; then 5 mills each 10 miles up to 300 miles.]		300 " " 290	26.5
		350 " " 300	27.0
		400 " " 350	27.5

In making joint rates over two or more lines on less than carloads add 6 cents, provided that joint through rates shall not exceed the rates named for 400 miles single line mileage, which shall be the maximum for all hauls between any points in the state of Louisiana.

Traffic Club of Chicago.

Isham Randolph, who was one of the engineers that accompanied Mr. Taft on his recent trip to the Panama canal, addressed the Traffic Club of Chicago at a luncheon on March 2. Mr. Randolph defended the lock type and said that the canal should be finished by January 1, 1914. His description of the canal was illustrated by stereopticon views.

The list of candidates for officers for the ensuing year that have been nominated by the nominating committee was given in the *Railroad Age Gazette* March 5, page 478. Two members' tickets have since been nominated. One of these tickets, for which F. P. Eyman, C. A. Bovee, Wm. J. Young, J. T. Morrison, Wm. Borner, E. C. Nettles and Ward Wire are sponsors, is as follows: President, W. M. Hopkins; First Vice-President, George T. Nicholson; Second Vice-President, Oscar F. Bell; Third Vice-President, F. B. Bowes; Secretary, John T. Stockton; Treasurer, John H. Grace. Directors for the two years: F. B. Montgomery, E. B. Boyd, H. C. Barlow and Guy S. McCabe. The other of the members' tickets, for which W. H. Wharton, Geo. H. Hull, C. A. Johnson, G. F. Perkins, R. C. Ross, R. J. Wood, P. E. Thomas, J. W. Taylor, H. E. Dickinson, C. H. Stevens and J. F. Hartsough are sponsors, is as follows: President, Oscar F. Bell; First Vice-President, H. A. Snyder; Second Vice-President, A. G. Huckin; Third Vice-President, C. B. Hopper; Secretary, John T. Stockton; Treasurer, John H. Grace. Directors for two years, G. H. Ingalls, E. W. Green, E. F. Bisbee and F. O. Becker. The election will be on March 30.

Railways Aiding Farmers.

The New York Central is preparing to run a special train, carrying lecturers and exhibits, for the instruction of farmers along its lines; and similar purposes are reported on the part of the Lehigh Valley and the Delaware & Hudson. The Erie ran a train of this kind some months ago, in connection with the Agricultural College at Cornell University. The lectures in the farmers' special train which was run by the Pennsylvania Railroad in Pennsylvania last November, were attended by about 5,000 farmers. Officers of the Pennsylvania say that as a result of what they have done to promote good farming in New Jersey, the value of products shipped from the southern part of that state in the month of July, 1908, was $1,178,000, which was about 50 per cent. more than the value of the same articles shipped in the year before. In Indiana the last of February four thousand farmers listened to lectures given on the Erie Railroad's "Seed Corn Special."

Railroad Officers.

ELECTIONS AND APPOINTMENTS.

Executive, Financial and Legal Officers.

Albert T. Perkins, President of the Marshall & East Texas, Vice-President of the St. Louis, Brownsville & Mexico, and Vice-President of the Houston Belt & Terminal Railway, was elected also on March 4 a Director of the Chicago, Milwaukee & Gary, and within a very few days will be elected President of the last named road, succeeding H. W. Seaman, resigned. He was born October 2, 1865, at Brunswick, Me. After graduating from Harvard University in the class of 1887, he began railway work in October of the same year as a clerk in the general freight office of the Chicago, Burlington & Quincy at Chicago. In August, 1888, he was made chief clerk in the Contracting Agent's office. From October to December, 1889, he was a Traveling Freight Agent, and in January, 1890, he was made chief clerk of the general freight office at St. Louis, Mo. In January, 1893, he was appointed General Agent at Hannibal, Mo., and in January, 1894, was made Local Freight Agent, at St. Louis. In January, 1897, he was appointed Superintendent of Freight Terminals, at St. Louis, and in February, 1899, Superintendent of Terminals at the same place. In June, 1902, he was appointed Superintendent of the St. Joseph division, Missouri district, with office at St. Joseph, Mo. On April 1, 1906, he became Expert Adviser of the Municipal Bridge & Terminals Commission of St. Louis. He was made Railroad Adviser of the St. Louis Trust Co. on December 1, 1907, and on January 1, 1908, was also elected First Vice-President and Managing Director of the St. Louis, Brownsville & Mexico. On August 19, 1908, he was elected also President of the Marshall & East Texas.

A. T. Perkins.

David Q. Lewis has been appointed the Assistant General Claim Agent of the Chicago & North Western, with office at Chicago.

R. A. Kleinschmidt has been appointed the General Solicitor for Oklahoma of the Atchison, Topeka & Santa Fe, succeeding the firm of Flynn & Ames.

J. H. Lauderdale, Local Treasurer of the Colorado Southern, New Orleans & Pacific, has been elected the Treasurer, succeeding W. C. Dufour, resigned.

Darius Miller, First Vice-President, and Daniel Willard, Second Vice-President of the Chicago, Burlington & Quincy, have been elected Vice-Presidents of the Colorado & Southern. A. D. Parker, Vice-President of the Colorado & Southern, continues in general charge of all the company's affairs in the west.

Hon. J. M. Dickinson, General Counsel of the Illinois Central, the Indianapolis Southern and the Yazoo & Mississippi Valley, having been appointed Secretary of War in the cabinet of President Taft, the Law Department of those roads will be handled as follows: Blewett Lee, General Attorney of the Illinois Central, and General Solicitor of the Indianapolis Southern, will have charge of the territory south of the Ohio river and the state of Indiana. He will also have charge of matters pertaining to interstate commerce, railway mortgages and bonds and corporate questions for the entire system. William S. Kenyon, General Attorney of the Illinois Central, will have charge of the territory north of the Ohio river, except the state of Indiana. He will also have charge of matters pertaining to contracts and off-line district suits for the entire system. C. N. Burch, General Solicitor of the Yazoo & Mississippi Valley, will hereafter report to Mr. Lee. The District Attorneys will report to the General Attorneys in their respective territories and the Local Attorneys in Minnesota and in Illinois in the territory north of Minonk and west of Cook county, will hereafter report to Mr. Kenyon. The General Attorneys will report to the President of the road.

Operating Officers.

F. A. Butterworth has been appointed the Manager of the Pere Marquette-Lehigh Valley Line, with office at Buffalo, N. Y.

W. D. Barclay has been appointed the General Manager of the Canadian Northern Quebec and the Quebec & Lake St. John, with office at Quebec.

H. M. Eshelman, Train Despatcher of the Trinity & Brazos Valley, has been appointed a Chief Train Despatcher, succeeding Joseph Munday, promoted.

J. C. Westcott, Trainmaster of the Atlantic Coast Line, has been appointed a Chief Night Despatcher of the Chicago & Alton, with office at Bloomington, Ill.

Herbert B. Calkins has been appointed the Acting Superintendent of the Missouri division of Wells Fargo & Co. Express, with office at St. Louis, Mo., succeeding C. R. Teas, transferred to the Milwaukee lines.

Grant S. Maxwell, formerly with the Texas & Pacific, has been appointed the Manager of the Freight Bureau Department of the Dallas Chamber of Commerce, with office at Dallas, Tex., succeeding J. C. Farley.

The Red River division of the St. Louis & San Francisco has been abolished and that territory divided as follows: The Creek and Sherman districts to the Southwestern division have been placed under the jurisdiction of H. F. Clark, the Superintendent at Sapulpa, Okla. The Ardmore and Arkinda districts to the Central division have been placed under the jurisdiction of LeRoy Kramer, the Superintendent at Ft. Smith, Ark.

D. F. Bucher, Superintendent of Car Service of the Mexican Central, has been appointed the Superintendent of the Gomez Palacio division of the National Railways of Mexico, with office at Gomez Palacio, succeeding L. S. Bourne, transferred. G. P. De Wolf, Engineer of Maintenance of Way and Bridges and Buildings of the National Lines of Mexico and the Hidalgo & Northeastern, has been appointed the Superintendent of the Monterey and Gulf division, with office at Monterey, succeeding E. E. Sirrine, resigned.

D. B. Fleming, Trainmaster of the New York Central & Hudson River, with office at Utica, N. Y., has been transferred as Trainmaster to West Albany, N. Y., succeeding W. H. Spice, promoted. C. D. Dager succeeds Mr. Fleming. F. B. Harrington has been appointed a Trainmaster, with office at Albany, in charge of passenger service on the main line and the West Shore, and such other duties as may be assigned to him. L. Phelps, Assistant Trainmaster, with office at Utica, will report to Mr. Fleming on matters relating to freight service and to Mr. Harrington on matters pertaining to passenger service.

John W. O'Brien, whose appointment as a Superintendent of the Lake Erie & Western, with office at Muncie, Ind., has been announced in these columns, was born January 17, 1872, at Paris, Ill. After a public school education he began railway work October 14, 1886, as operator and yard clerk of the Terre Haute & Peoria, now a part of the Vandalia, at Paris, Ill. In 1888 he was transferred to Decatur, Ill., as operator and superintendent's clerk of the same road. In 1889 he was made ticket agent, chief clerk and cashier of the Chicago & Western Indiana, at Chicago, and in 1891 was appointed Train Despatcher of the Lake Erie & Western, at Lafayette, Ind. In 1893, he was made Chief Despatcher of the same road at Lafayette, and in 1906 Trainmaster at Lima, Ohio, which position he held until his recent appointment.

Traffic Officers.

F. A. Nelson has been appointed a General Agent of the Kansas City, Mexico & Orient, with office at Kansas City, Mo., succeeding C. L. Hogan, resigned.

M. L. Fuller has been appointed a Traveling Immigration Agent of the Missouri Pacific, with office at St. Louis, Mo., succeeding A. H. Sevier, resigned.

H. C. Moran has been appointed a Commercial Agent of the St. Louis, Brownsville & Mexico, with office at Corpus Christi, Tex., succeeding C. J. Payton, resigned.

J. M. Andrew has been appointed a Traveling Freight Agent of the Baltimore & Ohio, with office at Huntington, W. Va., succeeding Frank W. Milling, transferred.

L. J. Broderick has been appointed a Traveling Freight Agent of the Iowa Central, with office at Peoria, Ill., succeeding O. T. Fagg, transferred. Mr. Fagg's office was at Monmouth, Ill.

G. P. French, Contracting Freight Agent of the Wabash, has been appointed a Traveling Freight Agent, with office at Salt Lake City, Utah. C. J. Helmer succeeds Mr. French, with office at Denver, Colo.

J. R. Mills, the chief clerk in the General Freight Offices of the Kansas City Southern, has been appointed the Assistant General Freight Agent, with office at Kansas City, Mo., succeeding Charles E. Perkins, resigned to go with another road.

W. J. Young, Commercial Agent of the Illinois Central, has been appointed the Export and Import Agent, with office at Chicago. H. M. Metz, Assistant Commercial Agent, succeeds Mr. Young, with office at Chicago. J. W. Rhodes, Commercial Agent of the Illinois Central and Indianapolis Southern, succeeds Mr. Metz, with office at Chicago. B. T. Breckenridge, Traveling Freight Agent of the Illinois Central, succeeds Mr. Rhodes, with office at Indianapolis, Ind. J. H. Lipsey succeeds Mr. Breckenridge, with office at Matoon, Ill.

Engineering and Rolling Stock Officers.

Malcolm Baxter, Master Mechanic of the Western Ohio Railway, has resigned, effective April 1.

J. F. Leonard, General Inspector of Signals of the Chesapeake & Ohio, has resigned to go into the railway and electrical supply business at Richmond, Va.

W. H. Fenley has been appointed the Signal Engineer of

the Chicago Great Western, succeeding C. A. Christofferson, whose resignation we have formerly announced.

E. V. Williams has been appointed a General Foreman, Locomotive department of the New York Central & Hudson River, with office at Avis, Pa., succeeding H. B. Whipple, promoted.

E. H. Hohenstein has been appointed a General Boiler Inspector of the Chicago, Rock Island & Pacific, with office at Horton, Kan., succeeding W. B. Embury, assigned to other duties.

The jurisdiction of Charles H. Cartlidge, the Bridge Engineer of the Chicago, Burlington & Quincy for the Lines East of the Missouri river, has been extended over the Lines West of the Missouri river.

The Mechanical Department of the National Railways of Mexico has been divided into two districts, the Eastern and the Western. The Eastern district will be the main line from Mexico City to Laredo, with all branches, including the main line from Mexico City to San Juan del Rio, the narrow gage system, the Cuernavaca district and the districts Gonzalez to Acambaro, Gonzalez to Jaral del Valle, Monterey to Hipolito and Paredon to Saltillo. The Western district will be the main line from San Juan del Rio, inclusive, to Ciudad Juarez, and all branches west, and will take care of all engines running into western terminals, such as those running between San Luis and Aguascalientes, Torreon to Saltillo and Gomez Palacio to Hipolito. The Eastern district will be in charge of Superintendent of Mechanical Department M. J. Schneider, with office at San Luis Potosi. The Western district will be in charge of Superintendent of Mechanical Department J. J. Waters, with office at Aguascalientes.

Arthur Monroe Kinsman, whose appointment as Chief Engineer of the Baltimore & Ohio was announced in these columns last week, was educated at the Worcester, Mass., Institute of Technology. He began railway work as rodman on a branch line of the Boston & Maine in 1877, and a year later became levelman on the Illinois Central. Later he was promoted to transitman, and then Resident Engineer. In 1880 he was appointed Engineer of Surveys and Construction on the Chicago, Milwaukee & St. Paul. After remaining here but a year, he was appointed Resident Engineer of the Illinois Central, and later became Division Engineer and then Superintendent of Construction. In 1895 he was appointed Chief Engineer of Construction and Maintenance of Way of the Wisconsin & Michigan. In 1899 he was appointed Engineer of Construction of the Baltimore & Ohio lines west of the Ohio river, with office at Akron, Ohio, and four years later was made Engineer of Construction of the entire Baltimore & Ohio system, with office at Baltimore, which position he held up to March 1, when he was made Chief Engineer.

A. M. Kinsman.

Purchasing Officers.

William McMaster, Assistant Purchasing Agent of the Chicago, Indiana & Southern and the Indiana Harbor Belt, has been appointed the Industrial Agent, with office at La Salle street station, Chicago, succeeding K. H. Bell, resigned. The position of Assistant Purchasing Agent has been abolished.

OBITUARY.

John W. Bastedo, District Passenger Agent of the Atchison, Topeka & Santa Fe at Detroit, died last week.

George I. Humphrey, who for 10 years was Tourist Passenger Agent of the Chicago & North Western and the Union Pacific, died March 1 of pneumonia at Saratoga, N. Y.

John A. Head, formerly the Superintendent of the Boone division of the Chicago & North Western, and for many years a railway contractor, died on March 2, at Rockford, Ill. He was 78 years old.

Noble D. Munson, formerly Superintendent of the Chicago, Burlington & Quincy, at Quincy, Ill., and at one time a member of the Illinois Railroad and Warehouse Commission, died at St. Paul, Minn., on March 7. He was born at Bristol, Vt., on September 21, 1827.

Frederick S. Winston, General Solicitor of the Chicago & Alton and the Michigan Central, died on March 7, at Pasadena, Cal. He was a member of the law firm of Winston, Payne, Strawn & Shaw, of Chicago, and was a national authority on corporation law. He was born in Franklin county, Ky., on October 27, 1856.

Joseph William Blythe, General Counsel of the Chicago, Burlington & Quincy, died suddenly from heart disease near Wapello, Iowa, on March 6, while on a hunting expedition with a party of friends. He was born on January 16, 1850, at Cranbury, N. J. He was educated at Princeton University and Hanover College, Indiana, and was made General Counsel of the Burlington in 1901.

Railroad Construction.

New Incorporations, Surveys, Etc.

ABERDEEN & ASHBORO.—Plans are said to have been made by this company to build an extension from a point in Montgomery county, southeast via Rockingham to a point in Richmond county.

ALBERTA & GREAT WATERWAYS.—W. R. and D. O. Clarke, bankers, Kansas City, Mo., are said to have announced that construction will begin this spring and that contracts for bridges and trestles have been let to J. A. L. Waddell. (Jan. 29, p. 235.)

CANADIAN PACIFIC.—This company plans to carry out improvements during 1909 on its western lines as follows:

Completion of double track on remaining 18 miles between Fort William, Ont., and Winnipeg, Man.

Extension from Teulon, Man., northerly about 17 miles, from a point two miles north of Komarno towards the Icelandic river.

Track is to be laid on the Mowbray branch from Mowbray, Man., southeasterly 6.5 miles.

On the line from Saskatoon, Sask., west to Wetaskiwin, Alb., 325 miles, track is to be laid from Wilkie, Sask., the present western terminus, 99.6 miles west of Saskatoon, to Hardisty, the present eastern terminus of the Wetaskiwin branch, 131.7 miles.

Branch to be built from Weyburn, Sask., to a point 20 miles west.

In Alberta, the line from Lacombe, east to Stettler, 51 miles, is to be extended east 35 miles.

A branch is to be built from Cheadle, Alb., on the Calgary section of the main line, north to the Lacombe-Stettler line, 40 miles.

A branch is to be built from Kipp, Alb., on the Macleod section of the Crow's Nest Pass line, north to a point on the Little Bow river, 28.5 miles.

Work will be continued on the bridges being built over the Belly river and the Old Man river. Between Fort William, Ont., and Winnipeg, Man., and on the Estevan (Sask.) section, 85-lb. rails will be laid on 60 miles, and ballasting will be carried out on the Souris, Man., and Estevan sections for 100 miles, and on the Yorkton, Sask., section for 30 miles. Extensions will be made to passing tracks and new tracks laid on the Last Mountain, Sask., and Estevan sections; an overhead bridge will be built at First street, Brandon, Man.

On the Western division 85-lb. rails will be laid as follows: Edmonton, Alb., section, 100 miles; Macleod, Alb., section,

53 miles; Cranbrook, B. C., section, 3 miles; ballasting will be carried out on the Portal, Sask., section, 50 miles; Lethbridge, Alb., section, 17.2 miles; Edmonton section, 100 miles; Macleod section, 30 miles; additional passing tracks will be laid on the Swift Current, Sask., section, with other extensions and additions to passing sidings, and betterments to bridges are to be made at various points of the division. A new yard is to be laid out at Moose Jaw, Sask., and a gravity water supply installed at Regina, Sask.

On the Pacific division ballasting is to be carried out on 16 miles of the Cascade, B. C., section, and the Cisco bridge is to be replaced with a heavier structure, of similar type to the existing one; a number of wooden bridges are to be replaced with permanent structures.

Additions to passing tracks, changes of line and improvements to yards are to be made in British Columbia at Kamloops, Mission Junction, Spences Bridge, North Bend and Vancouver. A new 280-ft. steel bridge is to be built on the Esquimalt & Nanaimo Railway.

CAROLINA, CLINCHFIELD & OHIO.—Bids are said to have been asked by this company for an extension from the present northern terminus at St. Paul, Va., north to the Chesapeake & Ohio at Elkhorn City, Ky., about 40 miles. (Feb. 19, p. 379.)

CROW'S NEST & NORTHERN.—An officer writes that it is expected to have the line from Crow's Nest, B. C., to Crown, 12 miles, completed this year. C. L. Butterfield, Chief Engineer, Spokane, Wash. (March 5, p. 481.)

DAKOTA WESTERN.—Incorporated in South Dakota with $2,000,000 capital, and headquarters at Whitewood. The company proposes to build a line from Whitewood, S. Dak., northeast to Attainment, in Meade county, 30 miles. The incorporators include W. P. Boniwell, H. T. Cooper and T. W. Thompson, of Whitewood; R. Cleaver and F. A. Robinson, of Empire, S. Dak.

DENVER & LINCOLNTON.—A charter is said to have been granted this company in North Carolina. The plans call for a line from Lincolnton, N. C., northeast to Denver thence south via Triangle to Lowesville, 25 miles. Address E. W. Shed, Carthage, N. C.

ESQUIMALT & NANAIMO RAILWAY.—See Canadian Pacific.

GULF LINE.—This company is said to be planning to build an extension from its present southern terminus at Bridgeboro, Ga., southwest to Camilla, 20 miles. The extension is eventually to be continued southwest to Bainbridge, about 60 miles from Bridgeboro.

HUDSON & MANHATTAN.—The fourth and last of the tubes under the North river, New York City, was blown through on March 11. The north of the two down-town tubes, which is 6,000 ft. long, will be used for westbound traffic.

HUDSON BAY RAILWAY.—Projected from The Pass, near the eastern boundary of Saskatchewan, Canada, northeast via Spirit Lake, either to Fort Churchill or to Port Nelson. An estimate of the comparative cost of the alternate routes from Spirit Lake shows the Fort Churchill route to be about 465 miles long and to cost about $11,608,000 for construction, with about $6,000,000 additional for harbor and terminal improvements, and the Port Nelson route to be about 397 miles long and to cost about $8,677,000, but the terminal and harbor improvements at the latter place would be greater than at Fort Churchill. John Armstrong, Ch. Engr., is said to favor the Port Nelson route, as that place is open to navigation from one to two months longer than Fort Churchill, and it is about 70 miles nearer Winnipeg.

LAKE ERIE & EASTERN.—Incorporated in Ohio to build a steam line from Lorain, Lorain county, southeast, via Youngstown, to a point near Lowellville, Mahoning county. Rights of way have been purchased through the city of Youngstown and franchises now being sought for crossing certain streets. J. W. Fawcett, Ch. Engr., Youngstown, Ohio.

LAKE SUPERIOR & LONG LAKE RAILWAY & TRANSPORTATION COMPANY.—Incorporation has been asked for by this company from the Ontario legislature to build a line from a point near the Canadian Pacific in the Thunder Bay district, Ont., near Black's, northeasterly via Owl lake and Long lake, to a point on the National Transcontinental (Grand Trunk Pacific). The company asks permission to operate a line of car ferries, steamers and barges on Owl lake and on Long lake, in connection with the proposed line. R. A. Pringle, solicitor, Cornwall, Ont.

MANUFACTURERS' RAILWAY.—According to press reports this company is planning to establish large freight yards south of St. Louis, Mo., and build an extension, also a belt line.

MILBROOK COMPANY.—See New York, New Haven & Hartford.

MORRISDALE RAILWAY.—Incorporated in Pennsylvania with $40,000 capital stock to build from Morrisdale, Pa., through Clearfield county. Clark Steele, President, Northumberland, Pa.

NASHVILLE & EAST TENNESSEE.—An officer writes that six miles of track are now laid on the line building from Asheville, N. C., to Huntdale, about 45 miles. The work will include one 1,600-ft. tunnel. Asheville Fuel, Dray & Construction Co., contractors, Asheville, N. C. B. N. Lee, Chief Engineer, Asheville. (March 5, p. 481.)

NEW YORK & PORTCHESTER.—See New York, New Haven & Hartford.

NEW YORK, NEW HAVEN & HARTFORD.—This company has applied to the New York Public Service Commission, Second district, for permission to acquire all the capital stock of the New York & Portchester and the New York, Westchester & Boston. The Millbrook Company, a subsidiary of the New Haven, now owns nearly all the New York & Portchester stock and over two-thirds of the New York, Westchester & Boston stock. The New Haven has advanced money to the Millbrook Company for construction, etc., and now wants to abolish this intermediary company and deal directly with the two railways, building one or both of them and beginning actual operation. (Feb. 19, p. 381.)

NEW YORK, WESTCHESTER & BOSTON.—See New York, New Haven & Hartford.

OREGON & WASHINGTON.—See Oregon Railroad & Navigation Co.

OREGON RAILROAD & NAVIGATION CO.—An officer of the Oregon & Washington writes that contracts have been let for building the Tacoma, Wash., tunnel, which will be 8,650 ft. long, single tracked. (Nov. 27, p. 1460.)

An officer of the Oregon & Washington writes that contracts have been let for building the single track from the boundary line betwen Aberdeen, Wash., and Cosmopolis, to a point opposite Gates City, in Chehalis county, about 38 miles. (Feb. 12, p. 331.)

SAPULPA & INTERURBAN (ELECTRIC).—An officer writes that contracts for bridging and grading are about to be let. Bridging includes one 300-ft. pile and steel bridge and a 200-ft. trestle. D. W. Patton, Chief Engineer, Poteau, Okla. (March 5, p. 482.)

SAULT STE. MARIE & ST. JOSEPH ISLAND.—Application has been made to the Ontario legislature by this company for incorporation. The company proposes to build a line from a point in the Algoma district near the Canadian Pacific, in the municipalities of Johnson and Tarbutt, via Campement d'Ours, thence to a point on St. Joseph Island near Gowas bay, or to a point on St. Joseph Island near Boulanger Point, thence via Richard's Landing and Marksville, to a point in the municipality of Jocelyn on St. Joseph Island; also a line from the first named point westerly to Sault Ste. Marie. Permission is asked to operate the necessary car ferries between the island and the mainland. P. T. Rowland, solicitor, Sault Ste. Marie, Ont.

TEXAS ROADS.—According to press reports from El Paso, Tex., the Cieneguata Copper Co. has been granted a charter in Mexico to build a narrow gage line from the company's mines in the Sahuaripa district to Tonichi, Sonora, on the proposed extension to the Cananea, Yaqui River & Pacific, about 40 miles.

TEXAS STATE.—Reports from Austin, Tex., indicate that a bill has been introduced in the legislature for an appropria-

tion of $150,000 to extend this road from Rusk, Tex., south about 100 miles, towards Houston, which may eventually be the southern terminus. (Jan. 29, p. 236.)

VIRGINIAN RAILWAY.—An officer writes that it is expected that track-laying will commence on the Winding Gulf branch about April 1, and to have the entire branch to Pemberton completed by November. (See this road under Railroad Financial News.)

WICOMICO ELECTRIC & POWER COMPANY.—Charter is said to have been given in Maryland to build a line from Nanticoke Point, Md., to Willard, in Wicomico county, 35 miles, also for a number of branch lines each to be 15 miles long. As soon as final arrangements are finished construction work is to be begun. M. V. Brewington, President, and J. D. Price, General Manager, Salisbury, Md.

Railroad Financial News.

BALTIMORE TERMINAL CO.—See Washington, Baltimore & Annapolis.

BESSEMER & LAKE ERIE.—In the year ended December 31, 1908, the company operated 210 miles of main line and had gross earnings of $5,240,951, a decrease of $1,136,001 from 1907. As in the case of the Pittsburgh & Lake Erie, nearly all of the decrease in gross earnings was accounted for by a decrease in the earnings from freight. These earnings amounted to $4,888,970 last year, being $1,077,196 less than in the previous year. Total operating expenses were $3,176,315, or $455,362 less than in 1907. It will thus be seen that there was a saving in expenses, due to a decrease in traffic. The saving was not in proportion to the falling off in earnings, so that the operating ratio, which was 56.95 per cent. in 1907, became 60.61 per cent. last year.

The number of tons of revenue freight carried in 1908 amounted to 9,357,966, or 1,977,395 tons less than in 1907. The average receipts per ton per mile were 0.439 cents in 1908 and 0.438 cents in the previous year. The ore movement in 1908 was 4,715,023 gross tons, showing a falling off of 1,128,163 tons for the year. The Bessemer road had a call on the ore shipments for the Carnegie furnaces in the Pittsburgh district, but this movement did not begin until the middle of June, so that for the first six months of 1908 a large percentage of the equipment was idle; but during the month of October there was handled from the dock to furnaces 815,000 tons of ore, which is the best record for any one month in the history of the road, 780,000 tons during August, 1907, being the previous high record. As is to be expected on a road handling such a large percentage of low-grade tonnage, the average trainload is very heavy, being 931 tons in 1908. The percentage of northbound tonnage was 34.76 and southbound tonnage 65.24 per cent., while the average trainload northbound was 517 tons and southbound 1,345 tons.

CHICAGO, MILWAUKEE & GARY.—The control and the management of this property are now passing into the hands of the St. Louis Union Trust Company interests. The securities of the syndicate, headed by H. W. Seaman, which several months ago acquired the Illinois, Iowa & Minnesota and changed its name to the Chicago, Milwaukee & Gary, have been deposited with the St. Louis Union Trust Co., and this company has arranged to finance all the road's present needs and its needs for two or three years to come. Albert T. Perkins, Railway Adviser to the St. Louis Union Trust Co., and executive of the roads which the St. Louis Union Trust Company interests control, was elected a director on March 4, and in a few days will be elected President, succeeding Mr. Seaman, and a new board of directors will be elected which will be controlled by the St. Louis Union Trust Co. interests but on which the parties now in control will have representation. Mr. Seaman will remain on the board. The syndicate now in control has put $5,000,000 into the property and operates 125 miles of line from Momence, Ill., to Rockford. The road is ballasted with gravel, is well tied and is laid with 70-lb. rails. Of this 125 miles of line the company owns all but 25 miles between Joliet and Aurora, which is leased from the Elgin, Joliet & Eastern. Besides the 100 miles of main line it has valuable terminals at Rockford, DeKalb and Momence and 23 miles of sidings. It connects with the Chicago & Eastern Illinois at Momence; the Wabash at Manhattan; the Michigan Central and the Elgin, Joliet & Eastern at Joliet; the Burlington and the Elgin, Joliet & Eastern at Aurora; the North Western and Great Western at DeKalb; the Great Western at Wilkinson; the St. Paul at Kirkland, and the Burlington, the North Western and the Illinois Central at Rockford. It owns nine locomotives, 350 freight cars, of which 300 are large modern furniture cars, and a few passenger cars. Owing to its location in a manufacturing district and its connections with a large number of important trunk lines, it is favorably situated to build up a large business in hauling manufactured products to the trunk lines and coal and raw materials from them. When the Illinois, Iowa & Minnesota was re-organized as the Chicago, Milwaukee & Gary, it was expected to make of it an outer belt around the Chicago district, extending from Milwaukee to Gary. Whether the extensions originally contemplated or any others will be made, those in control are not now prepared to say. It is possible that motor cars will be put on to handle passenger business.

DENVER, NORTH WESTERN & PACIFIC.—The Colorado-Utah Construction Co., which is building the Denver, North Western & Pacific, has sold $1,000,000 one-year 6 per cent. notes to George H. Burr & Co., Chicago. The notes are secured by bonds of the railway company, endorsed with the personal guarantee of David H. Moffat, President of the Denver, North Western & Pacific.

FONDA, JOHNSTOWN & GLOVERSVILLE.—The company has recently authorized an issue of $1,000,000 6 per cent. cumulative preferred stock. The stock is subject to call at 105, and has the same voting rights as the common. The road runs from Fonda, N. Y., to Northville, 26 miles.

GEORGIA TERMINAL CO. OF ATLANTA.—The United States Circuit Court on February 15 appointed H. M. Atkinson and P. S. Arkwright, receivers of the Atlanta, Birmingham & Atlantic, also receivers of the Georgia Terminal Co. and the Alabama Terminal Railroad of Birmingham, Ala., and Bessemer.

GRAND TRUNK PACIFIC.—Glyn, Mills, Currie & Co., London, offered February 20-25 £1,000,000 ($5,000,000) 4 per cent. debenture stock of the Grand Trunk Pacific at 90. Interest on this stock is guaranteed by the Grand Trunk. The proceeds of the sale are to be used for the purchase of additional rolling stock, which will be required on the opening of the Prairie section and the Lake Superior branch.

LONDON & NORTH WESTERN.—During the half year ended December 31, 1908, gross earnings from 1,975 miles operated and from rents, etc., totaled £8,068,435 ($40,342,175), a decrease of £306,788 ($1,533,940) from the earnings in the corresponding period of 1907. Working expenses amounted to £5,132,107 ($25,660,535) in the 1908 half year, being £221,577 ($1,107,885) less than in 1907. After paying interest on debenture stock and rents and leases, the company had a surplus available for dividends of £2,311,332 ($11,556,660), and adding that to the £96,967 ($484,835) surplus for the previous half year, there was left available for dividends for the half year £2,408,299 ($12,041,495) as compared with £2,499,437 ($12,497,185) in the corresponding half year of 1907. In all, £2,306,941 ($11,534,705) was paid in dividends, the annual rate on the consolidated stock being reduced from 7¼ per cent. in 1907 to 6¾ per cent.

The receipts from the 43,879,986 passengers carried amounted to £3,637,533 ($18,187,665), and the receipts from the carrying 25,613,873 tons of merchandise, live stock and minerals carried amounted to £4,729,652 ($23,648,260). The figures for the number of passengers carried are somewhat lower than for the corresponding half year of 1907, as are the number of tons carried, but the receipts from passengers were slightly greater in 1908 than in the previous year, while the receipts from freight were less.

There was spent for maintenance of way, works and stations £768,211 ($3,841,055) as against £830,377 ($4,151,-

885) in 1907, and for locomotive repairs and presumably renewals, £1,406,030 ($7,030,150) as against £1,503,564 ($7,517,820) in the previous year. Repairs of cars cost £426,648 ($2,133,240) as against £409,723 ($2,048,615).

The balance sheet shows sundry outstanding accounts of £1,875,694 ($9,378,470), and cash on hand of £2,027,771 $10,138,855), and general stores of materials on hand of £1,647,186 ($8,235,930).

Millbrook Company.—See New York, New Haven & Hartford.

Minneapolis, St. Paul & Sault Ste. Marie.—See Wisconsin Central.

Missouri, Oklahoma & Gulf.—The Fanco-American Bank is quoted as announcing the sale of 2,500,000, 5 per cent. bonds of the Missouri, Oklahoma & Gulf at 92½.

Missouri Pacific.—Kingdon Gould has been elected a director, filling the place made vacant some months ago by the resignation of Stuyvesant Fish. R. M. Galloway has also been elected a director.

New York & Portchester.—See New York, New Haven & Hartford.

New York, New Haven & Hartford.—The company has applied to the New York Public Service Commission, Second district, for permission to buy from the Millbrook Company the stock of the New York & Portchester and the New York, Westchester & Boston, and also whatever remaining stock in the Westchester company may be acquired from other parties.

The New York, New Haven & Hartford owns a majority of the shares of the Millbrook Company, which in turn owns all the stock of the New York & Portchester except nine shares, and the control of the New York & Portchester and the New York, Westchester & Boston is now held by the New Haven company, but it wishes to do away with the Millbrook Company so as to deal directly with the Westchester and Portchester roads.

New York, Westchester & Boston.—See New York, New Haven & Hartford.

Pennsylvania.—That part of the annual report for the year ended December 31, 1908, giving the financial results of the year's operation has been made public; but that section giving traffic statistics and other details of operation has not as yet been made public. The *Railroad Age Gazette* will review the report editorially when the complete figures are at hand.

The total gross earnings of all the transportation companies east and west of Pittsburgh and Erie owned, operated or controlled by, or affiliated in interest with, the Pennsylvania Railroad system, amounted to $274,338,804. This is a decrease from 1907 of $52,446,722. Operating expenses, including taxes, amounted to $203,605,536, a decrease of $45,010,425. There was a surplus after payment of dividends, extraordinary expenses and charging off amounts to the extraordinary expenditure fund of $1,051,563 last year as compared with $4,023,372, a decrease of $2,971,808. The Pennsylvania Railroad proper, which owns and operates the Pennsylvania lines east of Pittsburgh and Erie, and whose earnings and expenses were of course included in the above figures, had gross earnings of $136,296,871, and operating expenses, including taxes, of $101,400,993, leaving net earnings from operation of $34,895,878, and after paying $2,706,685 rental on roads operated on basis of net earnings, and adding $14,388,702 other income, the Pennsylvania Railroad had a gross income of $46,577,895. After deducting fixed charges and rentals, there was left $28,207,660 as compared with $33,575,056 in 1907. There was charged for extraordinary expenditures $4,538,981, and for dividends $18,875,681. In 1907 there was charged $3,260,651 for extraordinary expenditures and there was transferred $2,500,000 to the extraordinary expenditure fund. Dividends were paid at the rate of 6 per cent. in 1908 and 7 per cent. in the previous year. There was a balance transferred to profit and loss of $659,131 in 1908 and $2,351,424 in the previous year.

As we have previously announced, the stockholders are to vote on March 23 on the proposal to issue $80,000,000 bonds. At a meeting held March 9, Moorefield Storey offered a resolution directing that the new bonds be sold through open and competitive bidding, thus doing away with the necessity for having bankers underwrite the issue. The resolution was referred to the incoming board of directors.

Peoria & Eastern.—Officers are quoted as saying that the annual interest due April 1 on $4,000,000 4 per cent. noncumulative income bonds not being earned during the 1908 year, is not to be paid.

Pittsburgh & Lake Erie.—The annual report for the year ended December 31, 1908, shows that, with an operated mileage of 191 miles, gross earnings for that year amounted to $10,397,843, a decrease of $4,506,567 from 1907. Nearly all of this decrease was in the earnings from freight traffic, which amounted last year to $8,962,172, a decrease of $4,343,680 from 1907. Operating expenses also show a decrease, the amount spent in 1908 being $5,415,097, or $1,569,159 less than in 1907, the greatest decrease being in the cost of conducting transportation, $2,825,280 being spent for this account last year, or $720,546 less than in 1907. There was spent last year for new construction (additions and betterments) and charged to income account, $1,135,327, or less than half of what was spent in 1907. There was spent for new equipment (additions), $1,608,579, or $609,107 less than the amount spent in 1907. Dividends were reduced from 12 per cent. to 10 per cent., making a saving last year of $200,000. After payment of dividends, the company had a surplus of $339,892 as compared with $1,300,342 in 1907.

The decrease in freight earnings is explained by a decrease of 8,580,082 in the tons of revenue freight carried, and a decrease of 0.023 cents per ton per mile in the amount received for freight transportation. The number of tons of revenue freight carried last year totaled 19,215,998, and the amount received per ton per mile was 0.705 cents. Bituminous coal formed 41 per cent. of the tonnage of freight carried in 1908, and amounted to 7,911,266 tons last year as against 10,478,649 tons in the previous year. The character of the business of the Pittsburgh & Lake Erie is shown by the fact that 77 per cent. of its total tonnage was products of mines in 1908, and the efficiency with which it handled this low grade tonnage last year is indicated by an average revenue train load of 1,058 tons.

Salt Lake & Ogden.—N. W. Harris & Co., New York, and the Harris Trust & Savings Bank, Chicago, are offering $500,000 Salt Lake & Ogden first mortgage 5 per cent. bonds of 1909-1934 at 98. The proceeds of the sale are to be used to pay the road's floating debt of $150,000 and to complete and electrify its line. The road, operated by steam over private right of way, runs from Salt Lake City, Utah, through several intervening towns to Ogden, 35½ miles.

Virginian Railway.—Stockholders have authorized $1,500,000 first mortgage 5 per cent. bonds (which under the mortgage may be issued on branch lines at the rate of $50,000 per mile) on account of the construction of the Winding Gulf branch in West Virginia.

Wisconsin Central.—The committee appointed by the directors to make arrangements for the acquisition of the Wisconsin Central by the Minneapolis, St. Paul & Sault Ste. Marie announce that the Soo having secured a substantial interest in the common stock, desires to acquire control of the property through a lease or other lawful method, and has agreed to issue its "leased line stock certificates" in exchange for the preferred stock, which stock will be held in trust by the Bank of Montreal. By the terms of the "leased line stock certificates" the Minneapolis, St. Paul & Sault Ste. Marie will obligate itself to pay to the holders of such certificates 4 per cent. per annum, payable semi-annually for the term of 99 years, on conditions which the committee consider adequate for the protection of the interests of the holders. Holders of the preferred stock who desire the exchange must on or before March 20 deposit their certificates, subject to an agreement dated March 20, 1909, with either the Empire Trust Co., New York; the American Trust Co., Boston, Mass., or the Anglo-Austrian Bank, London, England.

Equipment and Supplies.

LOCOMOTIVE BUILDING.

The Granite City Railway, St. Cloud, Minn., will be in the market soon for 2 electric locomotives.

The Temiskaming & Northern Ontario, reported in the *Railroad Age Gazette* of February 12 as being in the market for 2 switching locomotives, has placed that order with the Canadian Locomotive Co., for July delivery.

The Chicago, Burlington & Quincy, reported in the *Railroad Age Gazette* of February 12 as being in the market for 25 locomotives, has ordered 25 Pacific locomotives from the Baldwin Locomotive Works for May and June delivery.

The Grand Trunk Pacific, reported in the *Railroad Age Gazette* of December 4 as being in the market for 50 locomotives, and on January 22 as having ordered 25 road locomotives from the Montreal Locomotive Works, Ltd., has ordered the 25 Mogul locomotives from the Canadian Locomotive Co., the entire order being for delivery during June and July, 1909.

General Dimensions.

	Road.	Mogul.
Weight on drivers	74,060 lbs.	138,176 lbs.
Total weight	121,688 "	161,976 "
Cylinders	18 in. x 24 in.	20 in. x 26 in.
Diameter of drivers	69 in.	63 in.
Boiler, type	Extended wagon top.	Extended wagon top.
Boiler, wkg. steam press.	200 lbs.	200 lbs.
Heating surface, tubes	1,259 sq. ft.	1,688.5 sq. ft.
" " firebox	126 "	188.1 "
" " total	1,385 "	1,876.6 "
Tubes, number	210	271
" outside diameter	2 in.	2 in.
" length	11 ft. 2¾ in.	11 ft. 11 in.
" material	Steel—Diamond B.	.....
Firebox, type	Sloping.	Sloping.
" length	95¾ in.	120 in.
" width	41⅞ "	40½ in.
" material	Steel.	Steel.
Grate area	28 sq. ft.	33.43 sq. ft.
Water capacity	7,000 U. S. gals.	7,000 U. S. gals.
Coal capacity	10 tons.	10 tons.
Fractive effort	18,158 lbs.	28,063 lbs.

Special Equipment.

Axles	Hammered iron or steel
Bell ringer	Pneumatic G. T. R. standard
Boiler lagging	Wood and asbestos
Brakes	Westinghouse American
Brake-beams	G. T. R. standard
Brake-shoes	Perfecto on drivers
Couplers	Washburn or Melrose
Driving boxes	Cast steel
Headlight	G. T. R. standard
Injector	Hancock
Journal bearings	Canadian bronze
Piston and valve rod packings	U. S. Metallic
Safety valve	World
Sight-feed lubricators	G. T. R. standard
Driving box lubricators	Franklin
Springs	Montreal Steel Works and Peech & Tozer
Staying	Radial
Steam gages	Utica
Steam heat equipment	Gold and Safety C. H. & L. Co.
Tires	Open hearth
Valve gear	Stephenson
Valves	Richardson

Each locomotive will carry a 15-ton Norton jack and a Tilden or other make replacer.

CAR BUILDING

The St. Louis, Brownsville & Mexico is in the market for five passenger coaches.

The Sapulpa & Interurban (Electric) is in the market for cars. See Railroad Construction.

The Granite City Railway, St. Cloud, Minn., will be in the market soon for 10 fifteen-ton flat cars.

The Canadian Northern has ordered 4 first-class coaches, 2 second-class coaches and 2 combination passenger and baggage cars from the Silliker Car Co.

The Atlantic Coast Line, reported in the *Railroad Age Gazette* of March 5, is in the market for 2 combination mail and express cars. These cars will weigh 40 tons and will be 60 ft. 4½ in. long, 8 ft. 10½ in. wide and 9 ft. 5⅝ in. high, inside measurements, and 63 ft. 4 in. long over buffers, 61 ft. 2 in. over end sills, 9 ft. 10½ in. wide and 14 ft. 3 in. high, over all. The underframes will be of wood, and the bodies of wood with steel end framing. Special equipment will include:

Bolsters, body	Double iron
Bolsters, truck	Composite
Brakes	Westinghouse high-speed
Brake-beams	Diamond special
Brake-shoes	Steel back
Brasses	A. C. L. standard solid
Couplers	Janney-Buhoup
Doors	A. C. L. standard
Door fastenings	A. C. L. standard
Draft gear	Westinghouse friction
Dust guards	Harrison
Heating system	Gold direct
Journal boxes	A. C. L. standard cast iron
Lighting system	Pintsch incandescent and oil
Paint	A. C. L. standard
Platforms	Dummy
Roofs	A. C. L. standard
Side bearings	Chicago Ry. Equip. Co. anti-friction
Springs	A. C. L. standard
Trucks	A. C. L. standard, 4-wheel
Vestibules	Dummy-Pullman pattern
Vestibule diaphragms	Ajax
Wheels	33-in. special cast iron
Window fixtures	Adlake

The New York Central Lines announced on March 5 the equipment ordered and to be ordered for delivery during 1909, including the total of 71 locomotives, 203 passenger cars and 5,450 freight cars. Contracts have already been given for 3,350 freight cars distributed as follows:

New York Central & Hudson River:
- 1,000 self-clearing steel hoppers. Standard Steel Car Co. (*R. A. G.*, January 15.)
- 1,000 standard box cars. Merchants' Despatch Co.
- 200 stock cars. Haskell & Barker
- 150 flat cars. Company shops, West Albany.

Lake Shore & Michigan Southern:
- 1,000 self-clearing steel hoppers. American Car & F'dry (*R. A. G.*, January 15.)

Bids are being received for the remainder of the freight equipment, consisting of the following cars for the lines indicated; and orders will probably be placed within a few days.

Lake Shore & Michigan Southern	1,000 box cars
Michigan Central	1,000 box cars
New York Central & Hudson River	100 flat cars.

Contracts have been placed for 135 passenger cars as follows:

New York Central & Hudson River:
- 50 standard 70-ft. coaches. American Car & Foundry
- 2 vestibuled smokers. American Car & Foundry
- 3 dining cars. Pullman Co.
- 7 steel buffet cars. Pullman Co.
- 11 steel postal cars. Pullman Co. (*R.A.G.*, January 29.)
- 10 milk cars. West Albany Shops

Lake Shore & Michigan Southern:
- 20 standard 70-ft. coaches. Pullman Co.
- 5 standard coaches. Barney & Smith
- 1 dining car. Pullman Co.
- 2 steel buffet cars. Pullman Co.
- 3 steel postal cars. Pullman Co.

Michigan Central:
- 11 standard 70-ft. coaches. Barney & Smith
- 1 dining car. Pullman Co.
- 2 steel buffet cars. Pullman Co.

Cleveland, Cincinnati, Chicago & St. Louis:
- 1 dining car. Pullman Co.

Rutland:
- 6 milk cars. Osgood, Bradley & Sons

Bids are being received for passenger cars as follows:

New York Central & Hudson River:
- 36 steel baggage and express cars.

Lake Shore & Michigan Southern:
- 2 café coaches.

Michigan Central:
- 3 coaches with smoking compartments.
- 2 combination coach and baggage.
- 10 steel baggage and express.
- 2 combination baggage and mail.
- 2 combination baggage, mail and express.

Cleveland, Cincinnati, Chicago & St. Louis:
- 3 combination coach and baggage.
- 5 steel baggage and express.
- 3 combination baggage and mail.

The 71 locomotives will be distributed as follows:

Lake Shore & Michigan Southern:
- 20 freight.

Michigan Central:
- 18 freight.
- 12 passenger.
- 15 switch
- 1 decapod.

Cleveland, Cincinnati, Chicago & St. Louis:
- 5 passenger.

The Grand Trunk Pacific has ordered 16 first-class coaches, 10 colonist cars, 8 second-class coaches, 5 parlor cafe cars and 3 dining cars from the Canada Car Co.

The Chicago, Burlington & Quincy, reported in the *Rail-*

road Age Gazette of February 12 as being in the market for 25 chair cars, has ordered 12 chair cars from the American Car & Foundry Co. These will be built at the St. Charles works and are for delivery in May. No additional chair cars will be ordered at this time.

IRON AND STEEL.

The Chicago & Alton is in the market for about 9,000 tons of rails.

The Chicago, Indianapolis & Louisville is in the market for 2,000 tons of rails.

The Chesapeake & Ohio is said to have given an order for 500 tons of bridge steel to the Pennsylvania Steel Co.

The Delaware & Hudson is said to have ordered 4,000 tons of rails from the Bethlehem Steel Co. and 250 tons of titanium rails from the Pennsylvania Steel Co.

The Minneapolis, St. Paul & Sault Ste. Marie, reported in the *Railroad Age Gazette* of February 5 as being in the market for 500 tons of plate girders for a bridge at St. Paul, Minn., is said to have ordered 400 tons from the Pennsylvania Steel Co.

The New York Central Lines have placed orders for a total of 101,000 tons of rails, the 1909 requirements, for early delivery, as follows: Lackawanna Steel Co., 51,000; United States Steel Corporation, 42,600; Algoma Steel Co., 5,400, and Bethlehem Steel Co., 2,000. The apportionment to the different roads of the system will be as follows: B. & A., 7,000; N. Y. C. & H. R., 37,000; Rutland, 2,000; P. & L. E., 9,000; L. S. & M. S., 15,000; C. C. C. & St. L., 5,000; L. E. & W., 2,500; C. I. & S., 3,500, and Mich. Cent., 20,000

General Conditions in Steel.—The United States Steel Corporation is said to have turned the tables on the independents and is now underbidding them. Prices seem to be the secondary consideration, with business getting the first. Reports indicate that the open market and subsequent price cutting has brought out a large amount of new orders, and that the Corporation booked on an average of 25,000 tons per day since the cutting began. The New York Central Lines is at present the most discussed railway system as regards steel, due to the placing of its 1909 rail requirements, 101,000 tons. These rails will be billed at the market price at the time of delivery, and although there is no variation from the present price of $28 at this time, it is possible that there will be before the rails are delivered. The New York Central specifications have the effect of lowering the price on these rails, as they are said to call for much better product than the old specifications did. The New York Central equipment requirement announced last week has resulted in inquiries regarding probable price concessions by manufacturers, especially those using a large amount of steel.

RAILROAD STRUCTURES.

Brandon, Man.—See Canadian Pacific under Railroad Construction.

Brownsville, Tex.—The St. Louis, Brownsville & Mexico and the National Railways of Mexico will jointly build a new bridge across the Rio Grande river at this point. The contract for the substructure has been given to the Foundation Co., New York, and for the superstructure to the Wisconsin Bridge & Iron Co., North Milwaukee, Wis. The bridge will be about 500 ft. long and is to be finished in six months.

Chicago.—The Chicago & North Western has given the contract for the construction of a steel viaduct at North State street over its tracks, extending from the Chicago river to Kinzie street, to the Ketler Elliot Erection Co., Chicago.

Long Island City, N. Y.—The Thompson avenue highway viaduct across the new Sunnyside yards of the Pennsylvania has been opened for traffic. It is 766 ft. long, and including approaches, 2,000 ft. long.

Salt Lake City, Utah.—The Denver & Rio Grande is having plans prepared by Henry J. Schlacks, Chicago, for the superstructure of its proposed station. It will be 105 ft. x 340 ft., two stories high, except the central part containing the waiting room, and will be of fireproof steel and concrete construction. The exterior will be of pressed brick and stone with metal roof, and the interior calls for a large amount of marble and mosaic work. It will cost, including platforms and subways, $600,000. Plans will be completed by March 13. (July 17, 1908, p. 549.)

Temple, Tex.—The Belton & Temple Traction Co. is preparing plans for enlarging its present car barns and repair shops to double their present capacity. A number of new machines and labor saving devices will be installed.

SIGNALING.

The Long Island Railroad has this week awarded to the Union Switch & Signal Company a contract for automatic block signals from The Raunt to Far Rockaway, about five miles, or about 10 miles of track. This is on the Rockaway division, which is electrically operated, with a third rail. Alternating current will be used for the signal track circuits. The new signals will be a continuation of the installation made by the Hall Signal Co. and described in this column February 12.

Steel Production and Capacity.

Including the Gary plant, the United States Steel Corporation will have a yearly capacity of about 3,500,000 tons of rails, the Gary plant supplying about 1,000,000 tons of this. As shown by the following table, this capacity is larger than the average annual production of rails by all companies in the United States. The actual capacity of all companies is probably about 6,00,000 tons.

Production of United States.

Year.	Tons.	Year.	Tons.
1908	1,921,611	1903	2,992,477
1907	3,633,654	1902	2,947,933
1906	3,977,889	1901	2,874,639
1905	3,375,929	1900	2,385,682
1904	2,284,711		

Supply Trade News.

The Northwestern Railway Supply Co., Chicago, has changed its name to the Central Railway Supply Co.

Edwin R. Kent & Co., Chicago, have removed their offices from 23 West Randolph street to the Commercial National Bank building.

E. E. Brosius, Alliance, Ohio, has been appointed the Sales Engineer of Pawling & Harnischfeger, Milwaukee, Wis., builders of traveling cranes.

The Belton & Trenton Traction Co., which is planning to enlarge its car barns and repair shops at Temple, Tex., will install a number of new machines.

The Ohio Locomotive Crane Co., Bucyrus, Ohio, has been incorporated by C. F. Mitchell, F. A. Bell, C. S. Rogers, M. E. Carroll and P. J. Carroll. The capital stock is $15,000.

The American Car & Equipment Co., 730 Old Colony building, Chicago, has just furnished a number of passenger cars for the Haag Shows as well as the M. L. Clark Shows.

Joseph F. Leonard, General Inspector of Signals of the Chesapeake & Ohio, resigned on March 1 to go into the railway and electrical supply business. His new office is in Richmond, Va.

The time for presenting designs at Milan, Italy, for the prize competition for automatic car couplers has been extended to March 31, 1909. The first prize is $2,000 and the second $1,000.

At the annual meeting of the stockholders of the Union Switch & Signal Co., Swissvale, Pa., held this week, it was stated that the company had unfilled orders on hand for business amounting to $1,357,000.

The Rockwell Furnace Co., New York. has purchased the factory, drawings, patterns, etc., of the Rockwell Engineering Co., and the business will hereafter be transacted under the name of Rockwell Furnace Co.

The Dorner Railway Equipment Co., Chicago, has been incorporated to buy and sell new and second-hand railway equipment. Capital stock, $2,500. The incorporators are: Otto G. Knecht, John W. Tibbitts and Ralph J. Taylor.

The Cutler-Hammer Manufacturing Co., Milwaukee, Wis., has opened a district office at 1108 Schofield building, Cleveland, Ohio. The new office will be in charge of C. J. Kruse, of the engineering department of the Cutler-Hammer company.

David J. Evans, who recently resigned as Manager of Sales for the Rail Joint Company, New York, is President of the Andresen-Evans Co., Chicago. H. P. Andresen continues as Vice-President and Chief Engineer of the latter company, which makes ore and coal unloading and conveying bridges, etc., and improved types of grab buckets.

The Vulcan Steam Shovel Co., Toledo, Ohio, has received an order for two large electric shovels, weighing 110 tons each and carrying four-yard dippers, from the Dolese & Shepard Co., Chicago. These shovels will be used for handling rock in quarries. The Vulcan Company says the prospects for the present year are very bright, contracts having been received for many of its shovels.

The Indianapolis Railway Mail Equipment Co., Indianapolis, Ind., the incorporation of which was reported in our issue of March 5, has been organized to develop an automatic mail catching and discharging device, patents on which it holds. The device has been tested three times by the government postal authorities and has been reported on favorably at least twice. At the suggestion of the postal authorities, the company will equip a short division of some railway for the purpose of making an extended test of the apparatus, covering a period of six months. Ernest L. Killen is Secretary, Newton Claypool building, Indianapolis.

The Independent Pneumatic Tool Co., Chicago, has appointed Manning, Maxwell & Moore, Washington street and Railroad avenue, Seattle, Wash., its exclusive representatives for the sale of Thor pneumatic tools and appliances in the state of Washington, except Clark county, and for the territory of Alaska. The Portland Machinery Co., 61 First street, Portland, Ore., has been appointed exclusive agent in Oregon and for Clark county, Washington. The business of the Independent company has shown a decided increase in these districts during the past few months and a complete line of Thor piston air drills, reaming, tapping flue rolling and wood boring machines, pneumatic riveting, chipping, calking and beading hammers and other air appliances will be carried in stock by its new representatives.

At the exhibit to be held next week at the Coliseum in Chicago, the G. Drouvé Company, Bridgeport, Conn., will show its Anti-Pluvius puttyless skylight and the Lovell window operator in space No. 83, northeast corner of the building. The Anti-Pluvius skylight has been furnished for a number of the well-known buildings that have recently been built or are now building, namely: The Fifth Avenue office building, New York; the Central Railroad of New Jersey ferry terminal, New York; Chicago City Railway car houses; new Lackawanna station at Scranton, Pa.; the Blake & Johnson Company's new plant at Waterbury, Conn. The Lovell window operator has been specified and used in connection with extensions and improvements made to plants in various parts of the country. The company will be represented by members of its staff from Bridgeport and Chicago offices.

For the fiscal year ended December 31, 1908, the gross earnings of the Railway Steel-Spring Co., New York, were $5,920,464. After deducting manufacturing, operating, administrative expenses, etc., the balance was $1,145,519. Charges of $169,899 were made for maintenance and depreciation. The remaining earnings, added to the previous surplus, amounted to $3,830,614. The interest on the Latrobe plant 5 per cent. gold bonds amounted to $209,692, and after deducting this, together with dividends on preferred and common stock, the surplus on December 31, 1908, was $2,270,942. Among the assets on the balance sheet as of December 31, 1908, are: Plants, properties, etc., $30,535,811; merchandise on hand, $1,914,250; accounts receivable, $1,211,790, and cash, $343,878. Among the liabilities are: Preferred stock, $13,500,000, and the same amount of common stock; Latrobe plant 5 per cent. gold bonds, $4,083,000; accounts payable, $588,000, and bills payable, $200,000. During the year there was added to capital account for additions to plants and properties, $245,173. The improvements and additions under construction at the Latrobe plant have been completed.

Julian L. Yale, President of Julian L. Yale & Co., Chicago, died of apoplexy at his home on March 3. The business of Julian L. Yale & Co. will probably be continued under that name. Mr. Yale was born in Herkimer county, N. Y., on March 26, 1840. He was a son of Linus Yale, the inventor of the Yale lock, and he was for a time connected with the Yale Lock Co., where he helped to assemble the first Yale locks made. He was for a time connected with New York establishments; then coming west he held several important positions with railways, the most important being that of Purchasing Agent of the Cleveland, Columbus, Cincinnati & Indianapolis, now a part of the Cleveland, Cincinnati, Chicago & St. Louis. After resigning from this position he went into the railway supply business at Cleveland, Ohio, representing among other firms the Carnegie Steel Co., Pittsburgh, Pa. He was appointed General Sales Agent of the Illinois Steel Co., Chicago, and this position he retained for eight or ten years, resigning to establish the firm of Julian L. Yale & Co., founded in 1897. He introduced the Shelby steel tube to the railway market, and was the representative of the Lackawanna Steel Co., New York, for a number of years. He was a member of the Chicago Club, the Union Club, the Illinois Athletic Association, the Cliff Dwellers, the Minnesota Club of St. Paul, the Union Club of Cleveland, the Union League Club of New York and the St. Louis Club. His success as a business man and his personal honesty made him a large number of close friends in all parts of the country.

TRADE PUBLICATIONS.

Rock Drills.—The Ingersoll-Rand Co., New York, in Form No. 4,002, illustrate and describe Sergeant rock drills, showing a number of illustrations of these drills in operation.

Street Cars.—The J. G. Brill Co., Philadelphia, are mailing three colored lithographs framed in heavy cardboard mats, showing the Brill convertible, semi-convertible and Narragansett cars.

Concrete Chimneys.—The Weber Company, Chicago, has just issued a pamphlet which contains a review of concrete chimneys, covering their origin and development. Another pamphlet, containing a list of industrial companies throughout the United States at whose power plants these chimneys are installed, is also being sent out.

Retaining Walls.—The Concrete-Steel Retaining Wall Co., Concinnati, Ohio, has just issued a 24-page pamphlet which describes the Bone system of retaining wall construction, including the standpoint of economy and advantages. The catalogue contains a number of half-tone illustrations and line cuts show various designs of this wall.

Electric Interlocking.—The Union Switch & Signal Co., Swissvale, Pa., has issued a catalogue of 200 pages, describing in complete detail its "all-electric" switch and signal machines. Signals and outdoor apparatus are shown, as well as machines, but there has been no attempt to include fittings which are common to all types of interlocking.

Riveting Machinery.—Catalogue No. 10, just issued by Chester B. Albree Iron Works Co., Allegheny, Pa., illustrates and describes Pittsburgh riveting machines and special types of pneumatic compression riveters. This catalogue presents the latest forms of the Pittsburgh riveting machines, showing the improvements which have been suggested by various operators.

Coal and Ash Handling Machinery.—Catalogue 32-A of the Jeffrey Manufacturing Co., Columbus, Ohio, describes with a number of illustrations, coal and ash handling machinery for

power plants. A large number of illustrations show existing installations, and line drawings show plans and elevations of a number of power plants in which these systems have been installed.

The Chicago & North Western, Union Pacific and Southern Pacific.—These roads have issued a unique brochure giving in detail the schedule of the Chicago White Sox Baseball Club on its second annual California training tour. The publication is in the shape of a baseball and contains photographs of all the members of the Chicago team, together with a map of their proposed schedule and views of scenery that they will pass.

Locomotive Driver Brake Shoe.—The Acme locomotive driver brake-shoe is illustrated and described in a recent pamphlet issued by the Allen & Morrison Brake-Shoe & Manufacturing Co., Chicago. The greater part of the publication is given to the results shown by the Acme brake-shoe under various conditions and severe tests in comparison with the "B" type, which is generally recognized as standard, and the plain cast iron shoe.

Bar, Mesh and Fabric Reinforcement.—The General Fireproofing Co., Youngstown, Ohio, is distributing a 28-page catalogue describing the square lug bar, cold twisted lug bar, expanded metal and wire fabric reinforcement which it manufactures. A large number of photographs show the various structures in which reinforcement of one of these types has been successfully used. Several pages are devoted to showing the style of mild steel wire fabric and slab thickness required for various live loads and spans.

Grinding Wheels and Machinery.—A catalogue just issued by the Norton Company, Worcester, Mass., covers the subject of alundum grinding wheels, grinding machinery, glass cutting wheels, India oil stones, etc. Alundum, the abrasive material used in the manufacture of these wheels, is said to be an electric furnace product. The catalogue is one which should be valuable to any one interested in the use of grinding wheels, as it contains a large number of line drawings showing sizes of the wheels made by this company. The catalogue also contains some mechanical data for particular use in this connection.

North Western-Union Pacific Tours.—The North Western-Union Pacific Tourist Department, S. A. Hutchison, Manager, 212 Clark street, Chicago, is distributing a 34-page pamphlet describing the personally escorted tours to California, Mexico, Utah and Colorado, via the Chicago Union Pacific and North Western Line and connections. Four tours have been arranged to leave Chicago on January 16 and 30 and on February 6 and 18. The pamphlet contains several views of scenery and sights included in the trip as well as complete information regarding hotels, rates, service, etc. A copy of the publication may be had upon request.

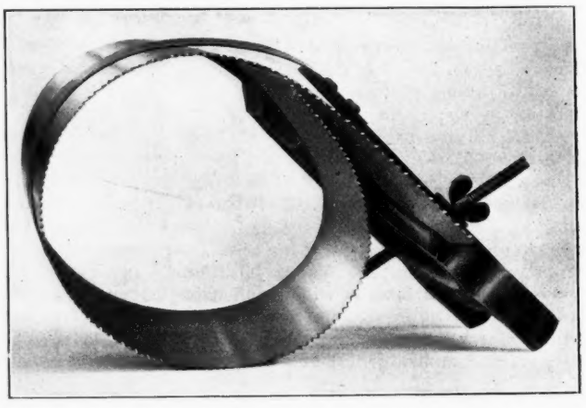
Refractories.—A small catalogue just issued by the Harbison-Walker Refractories Co., Pittsburgh, Pa., is a very neat and valuable hand book on the subject of silica, magnesia, chrome, fire clay brick and other refractories, which should be a very reliable hand book, as practically all the illustrations, cuts, etc., are said to have been supplied by the owners or patentees of the furnaces illustrated. The book is well bound in leather, and contains about 160 pages printed on heavy glazed paper. Stippled drawings showing the natural color and shape of various fire bricks for furnaces. A large number of plan and elevation drawings of blast furnaces, coke ovens, furnaces, etc., are included. A number of halftone illustrations show the various standard boiler settings, and several pages are devoted to tabulated data of particular use to those interested in fire bricks.

Vanadium Steel Hand Saws.

Few people have ever seen a carpenter's hand saw capable of being rolled to a complete spiral, without breaking and without straining beyond its elastic limit. It is also beyond the experience of most people that the same kind of a saw, designed for wood cutting, is capable of sawing through a 20-penny nail and a 1¼-in. gas pipe, without changing its set or dulling its teeth. The photographs show one of these saws rolled to a volute and clamped in that position after it has done this unusual work. Ten days later the clamp was loosened and the saw became absolutely straight. The picture of Mr. Wilson, President of the Union Saw Company, Williamsport, Pa., sawing through pipe is even more impressive. At the invitation of Joseph M. Flannery, of the American Vanadium Company, Pittsburgh, Pa., he came to New York and, in a parlor of the Waldorf-Astoria, talked to a party of deeply interested gentlemen on the art of tempering steel for saw blades and of his experiments and experiences. He answered many

Mr. Wilson Cutting Gas Pipe With His Hand Saw.

questions and his audience kept him busy for nearly two hours. He refused to answer about steel manufacture, of its science or its components; but of the results of tempering different kinds of steel he was full of positive information. He illustrated by testing a few hacksaw blades and by using hand saws to the point of abuse. After bending the saw blade to a spiral, it returned straight. It was then



Saw Rolled and Clamped; Returning Straight.

bent in a reverse direction to a spiral, and it persisted in returning to a straight line. Due to the vanadium and the skilful tempering, this saw steel has such toughness, hardness and high elastic limit that it would be difficult to destroy its usefulness. The steel he is using contains 0.18 per cent. of vanadium. The human interest in the meeting was even greater than the subject of it, for Mr. Wilson appeared to advantage, a master of his art and a natural gentleman.